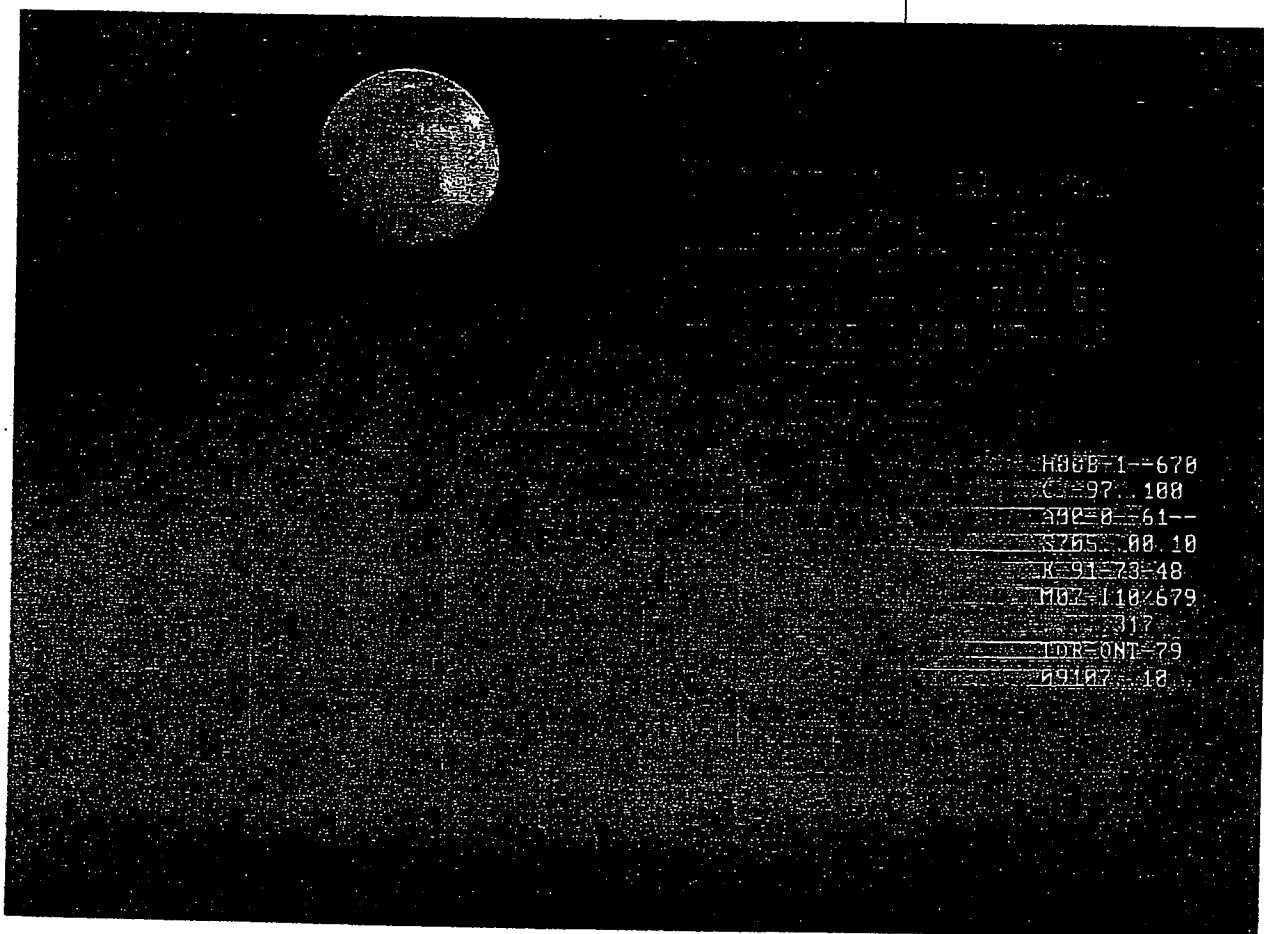# Cantel Mobitex

Data communications
for people on the move"

CANTEL
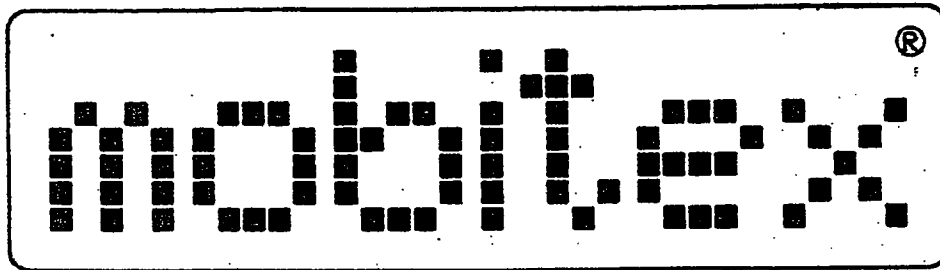
MOBITEX
TERMINAL SPECIFICATION
900 MHz 8000 bps

ROGERS CANTEL MOBILE INC.

Terminal type 3
LZBA 703 1001/05

R1A

CANTEL

mobitex ®

TERMINAL

SPECIFICATION

Approved by
MOBITEX OPERATORS ASSOCIATION

Jan-Olof Runnäs

Jan-Olof Runnäs, Chairman

Cantel Mobitex™

SPECIFICATION

FOR

EQUIPMENT TO BE USED WITH

CANTEL MOBITEX

RADIO DATA NETWORK

ISSUE R1A

8000 bps

Rogers Cantel Mobile Inc.
Data Communications Division
40 Eglinton Ave. East
Toronto, Ontario
M4P 3A2
Canada

Registration Number:_____

1. MOBITEX OVERVIEW

The Cantel Mobitex system is a trunked land based communications system designed to carry data traffic between fixed and mobile terminals. The Mobitex System consists of a Network and a collection of subscribers. The Network is a common carrier which transports information packages (packets). The subscribers are customers who have contracted with Cantel the Mobitex network operator to use the network services. Each subscriber must own, lease, or otherwise have access to a terminal through which he or she can transmit and receive messages. The contract between the subscriber and Cantel is referred to as a subscription.

This specification is intended to provide a description of the Mobitex system in Canada, sufficient to permit understanding of the system operation and terminal requirements, so that engineers, software designers, and manufacturers can design, manufacture, and test equipment which may be developed and sold as subscriber terminals in the Cantel Mobitex system.

While this specification has been developed for the design and manufacture of terminals for use in Canada, it also provides limited comments on the differences between Canadian and the US Mobitex systems, for the benefit of any manufacturers who wish to develop Mobitex terminals which are compatible for use throughout North America.

The applications of Mobitex to commerce are limited only by the creativity of the subscribers. The more common expected uses are:

1. Dispatch traffic, consisting of brief messages from a dispatcher in an office to mobile units in the field.

2. Requests for information or instructions from field operators to superiors and replies to such requests.

3. Data base access, where there is need to obtain information from a computer.

4. Data transfer, as between a computer in a vehicle and a computer in an office or data processing center.

5. Resource monitoring, such as keeping track of field staff and the completion of field tasks to aid in the efficient further dispatching or recall of personnel and equipment.

6. Resource control, such as the remote controlling of power plants, heating and air conditioning systems, processing facilities, etc., in remote or rural areas where wireline facilities are unavailable and expensive to install.

7. Fixed or mobile remote data gathering devices.

As seen from this list, communications may be between people, between a person and a machine (including but not limited to computers), and between computers (including between a computer controlled machine and its controller).The electromagnetic spectrum through which radio communication is feasible is limited, and it is important that users of the spectrum use it efficiently. Data communication is inherently much more efficient in spectrum use than voice communication. It allows many more users to share a single radio channel for information transfer than does voice transmission. Cellular communication, in which a low power channel may be reused several times within a metropolitan area, is also more efficient in spectrum use than the higher power broadcast communications, in which a channel can only be used once in a metropolitan area, and requires large separation distances before channels can be reused. The Mobitex system combines the advantages and efficiencies of data communication and cellular networking to provide a highly efficient use of the radio spectrum for message communication.

The Mobitex system is complex, and this specification provides a requirements description to the extent necessary for equipment designers, manufacturers, and Mobitex customers to understand it and to permit development, manufacture, and proper use of Mobitex terminal equipment. Chapter 2 provides a brief system description of the Mobitex system. The subsequent chapters provide the details necessary for terminal equipment design.

INTRODUCTION TO ISSUE NO. 1

This is Cantel's first issue of the 8K Mobitex Terminal Specification. It applies to fixed, mobile and portable terminals to be used with the Mobitex Network, which is installed and operated by Rogers Cantel Mobile Inc. in Canada.

The major part of this document was prepared by ERITEL AB, a Swedish Company, under the auspices of the Mobitex Operators Association (MOA), which is a group of representatives from all countries that use the basic Mobitex System. It should be noted that equipment built to this specification will also operate on the Mobitex Network operated by RAM Mobile Data in the United States. This document also includes requirements for equipment that will operate with other networks.

For example, some networks are permitted to offer optional voice service over their Mobitex network, whereas in Canada and the United States, voice service is not offered. Therefore, requirements herein that apply to voice service are not applicable to terminals that will be sold for use on the Cantel Mobitex network. The voice requirements have been left in the spcification so a manufacturer can consider designing a common product for sale in Canada, or elsewhere.

This document is divided into chapters. Chapter 1 is an introduction to the specification. Chapter 2 is an overview of the Mobitex system. Chapter 3 includes a general discussion of terminals. Chapter 4 includes a glossary of terminology and acronyms. Chapter 5 includes a list of references. The following chapters include the design requirements for each subunit of the terminal product(s):

1. For a fixed terminal
    Chapter 8 - Application Layer
    Chapter 9 - Network Layer
    Chapter 11 - Link Layer and Physical Layer
    Chapter 12 - Other Requirements

2. For the mobile radio
    Chapter 18 - Radio Equipment
    Chapter 20 - Other Requirements

3. For the mobile and portable modem/radio controller
    Chapter 9 - (Appendix C) - Network Layer
    Chapter 15 - Draft Hand-held Portable Protocol
    Chapter 16 - Link Layer
    Chapter 17 - Physical Layer
    Chapter 19 - Other Interfaces
    Chapter 20 - Other Requirements

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Chapter 6 includes all requirements not recorded elsewhere that are applicable to the use of terminals in Canada.

A manufacturer has the option of designing and supplying fixed terminals and/or mobile terminals. The latter can be broken down into the radio, modem/controller, and user terminal. Therefore, a manufacturer can elect to provide a total assembly of all three parts, a radio, a modem/controller, or a terminal, or any applicable combination of the above.

To facilitate interconnection of mobile terminal components from various manufacturers, and to permit standardization of vehicle cabling, specific electro/mechanical interfaces are defined herein for each component.

If a manufacturer elects to design a combined radio modem in one housing, the interface specified herein would not apply. Likewise, if a manufacturer elects to manufacture a totally integrated radio/modem terminal, such as a hand held unit, the interfaces herein need not apply.

All questions or comments related to this Cantel version of the Mobitex specification should be sent to Cantel. The address is:

Terminal Specifications Inquiries
Rogers Cantel Mobile Inc.
Data Communications Division
40 Eglinton Ave. East
Toronto, Ontario
Canada
M4P 3A2

Phone: (416) 440 1400
Fax: (416) 480 9069

Numbered copies of this specification will be issued on request to the above. Revision material will be periodically issued and sent to each registered holder of the specification.

Transfer of a numbered specification within a company should be reported to Cantel at the above address so revision material will be sent to the proper person. Copies made of this specification must be internally controlled since revision material will only be sent to registered holders of the specification. Copies may not be distributed outside the organization to which the specification was originally issued.

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Cantel Mobitex™			
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SIGNIFICANT CHANGES FROM SPECIFICATIONS R4B:

1. "Transferable subscriptions" have been renamed "Personal subscriptions" (Sect. 3.1.2).

2. Emergency traffic is not restricted to origination from mobile terminals (Sect. 3.2.3).

3. A "network identification" has been added to accommodate joint traffic where multiple networks exist (Sect. 3.3.12).

4. A "traffic area identification" has been added to specify geographical areas for mobile control (Sect. 3.3.13).

5. The time limit before transmit of an "active" message after loss of network contact in Sect. 7.1.2 has been changed and is specified in R1-06.

6. An electronic serial number is now required on all mobile terminals (Sect. 8.2.6).

7. References to a "National System Channel" have been replaced by "System Channel" to reflect the fact that system channels may vary by geographical area. (Sect. 9.1.2).

8. All references to VOICE services may be ignored.

9. An appendix has been added to this section. It contains on overview of the new roaming algorithm to be used in the 8000 bps Mobitex system.

10. Section 15, Protocol for hand-held terminals has been added.

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CAPTION LIST

Dokumentnummer · Dokument number		
001 53 - 01/LZBA 703 1001	Arrangement of the documents	1
Godkänd · Approved ET/UC Gim Gim	MOBITEX system description	2
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Pärm · Binder MOBITEX FIXED TERMINAL SPECIFICATION	Terminology	4
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Dokumentnummer · Document number 001 53 - LZBA 703 1001	Arrangement of the documents	1
	MOBITEX system description	2
Godkänd · Approved ET/UC Gim	General description of terminals	3
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Firm · Binder MOBITEX TERMINAL SPECIFICATION	Terminology	4
	References	5
Upplag 0	Network operator information	6
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Godkänd - Approved ET/UC Gim *G̶ᴛᴍᴡ*	MOBITEX system description	2
Datum - Date 1989-05-19 **Rev** A	General description of terminals	3
Pärm - Binder MOBITEX MOBILE TERMINAL SPECIFICATION	Terminology	4
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Granskv Godkänd Doc responsapprovec ET/SYSC STT *SY*		Datum Dve 1990-02-26	Rev B
		File F.4 MTS01A.5	
Benämning		Title MOBITEX TERMINAL SPECIFICATION Fixed and mobile terminals	

Cantel Mobitex™

This set of documents, entitled "MOBITEX TERMINAL SPECIFICATION" applies to:

MOBITEX system: Cantel Inc, Canada
                       Fixed and mobile terminals

Terminal type: 3
                       900 MHz/8 kbps

Binder identification: LZBA 703 1001/05, R1A

COMMON SECTIONS:

Section	Document number	Rev
Caption List	001 53 - LZBA 703 1001 Ue	E
Section 1: Arrangement of documents List of documents	1551 - LZBA 703 1001 Ue This document	E
Section 2: System description MOBITEX	1551 - A 296 5073 Ue	J
Section 3: General description terminals	1056 - A 296 5170 Ue	B
Section 4: Terminology	0033 - LZBA 703 1001 Ue	E
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Section 8: Application layers	2/1056 - A 296 5171 Ue	G
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| | Datum Date 1990-02-26 | Rev B | Fil Fil MTS01A.5 |

FIXED TERMINAL SECTIONS:

Section	Document number	Rev
Section 11:		
X.25 interface, fixed terminal	1056 – A 296 5491 Ue	C
HDLC interface, fixed terminal	6/1056 – A 296 5171 Ue	E
BSC interface, fixed terminal	1056 – A 296 5490 Ue	C
MASC interface, fixed terminal	1056 – A 296 5516 Ue	D
Asynchronous terminals, MPAD	1056 – A 296 5454 Ue	C
Section 12:		
Other requirements, fixed terminal	1056 – A 296 5176 Ue	C

MOBILE TERMINAL SECTIONS:

Section	Document number	Rev
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Link layer, mobile terminal	9/1056 – A 296 5171/02 Ue	A
Appendix A, Frames	91/1056 – A 296 5171/A2 Ue	A
Section 17:		
Physical layer, mobile terminals	10/1056 – A 296 5171/02 Ue	A
Section 18:		
Radio equipment, mobile terminals	1056 – A 296 5173/04 Ue	A
Appendix A, Measurement methods	A/1056 – A 296 5173/01 Ue	C
Section 19:		
Other interfaces,		
mobile and fixed terminals	1056 – A 296 5175/3 Ue	A
Appendix A, Commands	2/1056 – A 296 5175/2 Ue	A
Appendix B, Application example	1/1056 – A 296 5175 Ue	B
Section 20:		
General requirements,		
mobile terminals	1056 – A 296 5177/02 Ue	A

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ET/SYSC STT STT		Date Date 1990-02-26	Rev B	F. File MTS01B.5 ·
Cantel Mobitex™		MOBITEX TERMINAL SPECIFICATION Fixed terminals		

This set of documents, entitled "MOBITEX TERMINAL SPECIFICATION"
applies to:

MOBITEX system: Cantel Inc, Canada
                                   Fixed terminals

Terminal type: 3
                                   900 MHz/8 kbps

Binder identification: 01/LZBA 703 1001/05, R1A

COMMON SECTIONS:

Section	Document number	Rev
Caption List	001 53 – 01/LZBA 703 1001 Ue	A
Section 1: Arrangement of documents List of documents	1551 – LZBA 703 1001 Ue This document	E
Section 2: System description MOBITEX	1551 – A 296 5073 Ue	J
Section 3: General description terminals	1056 – A 296 5170 Ue	B
Section 4: Terminology	0033 – LZBA 703 1001 Ue	E
Section 5: References	0015 – LZBA 703 1001 Ue	E
Section 6: Network operator documents		
Section 7: Application layers	2/1056 – A 296 5171 Ue	G
Section 8: Network layer Appendix A, Packet formats Appendix B, Dialogues Appendix C, Logical description	5/1056 – A 296 5171/2 Ue 51/1056 – A 296 5171/2 Ue 52/1056 – A 296 5171/2 Ue 53/1056 – A 296 5171/2 Ue	A A A A

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FIXED TERMINAL SECTIONS:

Section	Document number	Rev
Section 9:		
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HDLC interface, fixed terminal	6/1056 – A 296 5171 Ue	E
BSC interface, fixed terminal	1056 – A 296 5490 Ue	C
MASC interface, fixed terminal	1056 – A 296 5516 Ue	D
Asynchronous terminals, MPAD	1056 – A 296 5454 Ue	C
Section 10:		
Other requirements, fixed terminal	1056 – A 296 5176 Ue	C
Section 11:		
Other interfaces,		
mobile and fixed terminals	1056 – A 296 5175/3 Ue	A
Appendix A, Commands	2/1056 – A 296 5175/2 Ue	A
Appendix B, Application example	1/1056 – A 296 5175 Ue	B

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Granskav Godkand Corresponsapproved ET/SYSC STT _STT_		Datum Date 1990-02-26	Rev B	F. F.o MTS01C.5
Benämning		Title MOBITEX TERMINAL SPECIFICATION Mobile terminals		

Cantel Mobitex™

This set of documents, entitled "MOBITEX TERMINAL SPECIFICATION" applies to:

MOBITEX system:	Cantel Inc, Canada Mobile terminals
Terminal type:	3 900 MHz/8 kbps
Binder identification:	02/LZBA 703 1001/05, R1A

COMMON SECTIONS:

Section	Document number	Rev
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Section 2: System description MOBITEX	1551 - A 296 5073 Ue	J
Section 3: General description terminals	1056 - A 296 5170 Ue	B
Section 4: Terminology	0033 - LZBA 703 1001 Ue	E
Section 5: References	0015 - LZBA 703 1001 Ue	E
Section 6: Network operator documents		
Section 7: Application layers	2/1056 - A 296 5171 Ue	G
Section 8: Network layer Appendix A, Packet formats Appendix B, Dialogues Appendix C, Logical description	5/1056 - A 296 5171/2 Ue 51/1056 - A 296 5171/2 Ue 52/1056 - A 296 5171/2 Ue 53/1056 - A 296 5171/2 Ue	A A A A

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MOBILE TERMINAL SECTIONS:

Section	Document number	Rev
Section 9:		
Link layer, mobile terminal	9/1056 – A 296 5171/02 Ue	A
Appendix A, Frames	91/1056 – A 296 5171/A2 Ue	A
Section 10:		
Physical layer, mobile terminals	10/1056 – A 296 5171/02 Ue	A
Section 11:		
Radio equipment, mobile terminals	1056 – A 296 5173/04 Ue	A
Appendix A, Measurement methods	A/1056 – A 296 5173/01 Ue	C
Section 12:		
Other interfaces,		
mobile and fixed terminals	1056 – A 296 5175/3 Ue	A
Appendix A, Commands	2/1056 – A 296 5175/2 Ue	A
Appendix B, Application example	1/1056 – A 296 5175 Ue	B
Section 13:		
General requirements,		
mobile terminals	1056 – A 296 5177/02 Ue	A

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Dokansv/Godkänd · Doc respons approved		Datum Date	Rev	Fil File
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Benämning		Titel		

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MOBITEX
Terminal specification
Arrangement of documents

SUMMARY

This document is an introduction to MOBITEX TERMINAL
SPECIFICATION. The document explains the purpose of the
specifications included, as well as how they are arranged.

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Cantel **Mobitex**‑	Nr Nr 1551 – LZBA 703 1001 Ue		
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Cantel Mobitex~	Nr Vn 1551 – LZBA 703 1001 Ue		
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1 INTRODUCTION

This set of documents contains specifications and recommendations for fixed and mobile terminals to be connected to the MOBITEX network.

The purpose of the contents, is to define how a terminal is to function to be used in the MOBITEX network.

Terminals that should be connected to MOBITEX are tested in accordance with these specifications.

To every MOBITEX system, one or several unique binders of MOBITEX TERMINAL SPECIFICATION (MTS) is made up. The reader should observe, for which network and terminal type the specification is relevant.

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Cantel Mobitex ˜	Nr No 1551 - LZBA 703 1001 Ue	
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2 DOCUMENT ARRANGEMENTS

2.1 SECTION ORGANIZATION

The documents are divided into three main parts as shown
below.

Common sections

Common documents both for fixed and mobile terminals, such
as system descriptions, network operator information and
protocols for higher layers.

Fixed terminal sections

Documents refering to fixed terminals, such as protocols
and line interfaces.

Mobile terminal sections

Documents refering to mobile terminals, such as protocols
and specifications for radio equipment.

The following chapters show the contents and the purpose
of each section.

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2.2 COMMON DOCUMENTS

Section Arrangement of the documents

Includes this document, and a document list which shows the document number and revision of all documents included in the present specification.

Section System description MOBITEX

The MOBITEX communication network is described in general. It is shown where the terminals are connected to the network, how the network is designed and where the interface between the network and the terminal is.

This section also describes the subscription types and services in the network.

Section General description of terminals

Provides a general description of the MOBITEX terminals, i.e. fixed and mobile terminals.

Section Terminology

Describes terms and abbreviations used in the specifications.

Section References

Gives a general illustration of the national and international documents referred to in this specification.

Section Network operator information

Consists of any type of network operator information. It could be related to both the network, such as bit rates for fixed terminals, frequency plans and network operator addresses etc.

This section completes the specification with information not given in the other sections. It is therefore important that the reader is familiar with the contents of this section.

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Section **Application layer**

> Specifies the interface to the user of the terminals,
> i.e. how the terminal should support the subscriber
> when using the terminal.
>
> The application layer interface to the lower layers is
> also specified.

Section **Network layer**

> Specifies the structure of packets used by both the
> MOBITEX network and the terminals. It is also specified
> how packets are transmitted between the sender and the
> addressee.
>
> As a guide.line for implementation, a logical descrip-
> tion of the network layer for mobile terminals is also
> included.

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2.3   DOCUMENTS RELATED TO FIXED TERMINALS

Section Interface requirements, fixed terminal

    Specifies the different types of line interface's for
    the link layer and physical layer, with connection
    procedure and frame sizes. The documents refers to a
    considerable degree to ISO standards.

Section Other interfaces, fixed terminal

    See section "Other interfaces, mobile and fixed
    terminal".

Section Other requirements, fixed terminal

    Contains requirements for the environment, power
    supply, marking control devices and indications.

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2.4   DOCUMENTS RELATED TO MOBILE TERMINALS

Section **Link layer, mobile terminal**

Specifies the radio interface's link layer with coding, frame structure, transmission of frames etc.

As a guide line for implementation, it also consists of a logical description.

Section **Physical layer, mobile terminal**

Specifies carrier wave modulation and conversion between digital data and analog signals.

As a guide line for implementation, it also consists of a logical description.

Section **Radio equipment, mobile terminal**

Contains requirements for the mobile terminal's radio equipment.

Section **Other interfaces mobile and terminal**

Provides recommendations of which protocol to be used for the interfaces between the mobile terminal's central unit and peripheral equipment such as printers, external operator units etc.

This recommendation is also used to show which protocol to be used for the interfaces between the mobile terminal's central unit and fixed terminals.

Section **General requirements, mobile terminal**

Contains requirements for the environment, power supply, marking, control devices and indicators.

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Cantel Mobitex ™	Nr·No 1551 – LZBA 703 1001 Ue		
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3 DOCUMENT ADMINISTRATION

This chapter will give the reader a brief idea of how to identify the included documents and how to use the internal references.

3.1 DOCUMENT IDENTIFICATION

Each individual document in the terminal specification has its own unique document number. This number is written at the top of each page to the right, in the field "No". This document, for example, has document number:

> 1551-LZBA 703 1001 Ue.

Below the document number is the printing date of the document, on the form year-month-day, and the current revision of the document.

Each document also got its own designation to be used in daily speech. This designation refers to the library section, and its version related to frequency, baud rate, function etc. The designation is placed under document identification number in the field "File".

The following format is used:

MTSNNA.X

MTS	begins all designations (= Mobitex Terminal Specification)
NN	section number used in the binder, 1 – 20
A	appendix, A-Z (used when applicable))
X	version, 1 – n (related to frequency, baud rate, function etc.)

This document, for example, has document designation:

> MTS01.1

On the next page, is the first version of each document listed. (Due to extended functionality new versions may have been made up.)

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Cantel Mobitex	Nr No 1551 – LZBA 703 1001 Ue		
	Datum Date 1990-02-15	Rev E	Fil File MTS01.1

Designation	Document title / Binder section title
MTS00.1	Caption list
MTS01.1	Arrangement of the documents Document list
MTS02.1	MOBITEX System description
MTS03.1	General description of terminals
MTS04.1	Terminology
MTS05.1	References
MTS06.1	Network operator documents
MTS08.1	Application layer
MTS09.1 MTS09A.1 MTS09B.1 MTS09C.1	Network layer – " –, Packet formats – " –, Dialogues – " –, Logical description (8 kbps only)
MTS11HDLC.1 MTS11X25.1 MTS11BSC.1 MTS11MASC.1 MTS11MPAD.1	Interface requirements, fixed term. – HDLC – " –, – X.25 – " –, – BSC – " –, – MASC – " –, – MPAD
MTS12.1	Other requirements, fixed terminal
MTS16.1 MTS16A.1	Link layer, mobile terminal Link layer, mobile terminal – Frames
MTS17.1	Physical layer, mobile terminal
MTS18.1 MTS18A.1	Mobile radio equipment – " –, Measurement methods
MTS19_1 MTS19A.1 MTS19B.1 MTS19C.1	Other interfaces, mobile and fixed term. – " –, Commands – " –, Application example – " –, Monitoring other channels than MOBITEX (1200 bps only)
MTS20.1	Other requirements, mobile terminal

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Cantel Mobitex ™	Nr No 1551 – LZBA 703 1001 Ue		
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3.2   REFERENCES

On the last page of each document an index which shows all references made in the document and on which page(s) they are made.

The references are made on the form R1-nn, where nn refers to the section.

The reference designations used is also shown on the last page of the document.

3.3   SPECIFICATION SEPARATION

The terminal specification can be separated into two specifications, one for the mobile terminals and another for the fixed terminals. The common sections (1-9) are the same in both the specifications.

Below are the identification numbers of the binders when separated:

MOBITEX fixed terminal specification   01/LZBA 703 1001/nn

MOBITEX mobile terminal specification   02/LZBA 703 1001/nn

The suffix added after the identification number shows which network operator the specifications are intended for.

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Uppgjort Prepared	Faktansvarig - Suoject responsum	Nr No		
ET/SYS MÖt	ET/SYS GCn	1551 – A 296 5073 Ue		
Dokanrv-Cookand Doc:respons approved		Datum Date	Rev	Fü Füs
ET/SYSC STT STi		1990-02-19	J	MTS02.1
Benamnxg		Title		
Cantel Mobitex		Mobile radio communication system MOBITEX		

MOBITEX SYSTEM DESCRIPTION

ABSTRACT

This document gives a brief description of MOBITEX, a trunked land-based communication system, which is primarily designed for data and speech traffic between fixed and mobile terminals.

This description does not apply to any particular release of the system, and contains no requirements for implementation of terminal functions.

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1 INTRODUCTION

The major part of today's land mobile communication is of the dispatch type, i.e. communication between field personnel in mobile units and their dispatch centres. Most communication is in the form of speech. Each company normally has its own radio system and has been assigned a frequency channel to be shared with other companies in the same area, or has been assigned its own frequency channels with little or small potential for inter-company traffic should this be required. In most cases the frequencies are used very inefficiently.

The increasing demand for land mobile communication and the limited availability of frequencies has resulted in an acute deficiency of frequencies in several geographical areas, particularly in and around major urban areas. The only solution to this problem is to use the frequencies more efficiently. One way of doing this is to transmit as much information as possible as digital data, another is to let several users operate on a number of common frequency channels (trunked channels). In a common, trunked system the frequencies can be used 2-7 times more efficiently than in conventional systems. At the same time the overall investment for the base radio station network is reduced or the users can get a more operationally-efficient communications system for the same cost.

In MOBITEX, digital data (e.g. text and status) can be transferred and speech communication can be established on a number of common channels. The fixed network (base radio stations and exchanges) are installed and operated by the network operator. This part should be regarded as a transparent transmission link for data and speech between one terminal's output and another terminal's input. The user can design his own communications system by adapting the design of his terminals to his requirements. The terminals use MOBITEX as a communication link between them.

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2   BASIC REQUIREMENTS

The following requirements have formed the basis for the development work:

- the system must be primarily designed for dispatch traffic.

- the changing over from an existing radio network to MOBITEX is to be facilitated as far as possible,

- it must be possible to use the system for both speech and text and for other data communication between connected units,

- the system must be transparent for user data, customer adaptation of terminals must be possible,

- emergency messages from mobile units must be transmitted in plain text,

- it must be possible to initiate emergency messages from a pocket transmitter when outside a vehicle,

- number dialling must be facilitated and it must be possible to call both individuals and groups,

- the system must keep track of the mobile units so that calls can be automatically routed to the correct base radio station,

- communication must be possible between mobile units and external networks (e.g. telephone and data networks).

Exhibit 2, p. 37

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3 TRAFFIC FACILITIES

MOBITEX provides the facilities for message traffic of the store-and-forward type and for traffic via line connections (primarily speech) between terminals connected to the MOBITEX network and between its terminals and external networks (telephone and data networks).

3.1 SUBSCRIPTION

A subscription to MOBITEX comprises either a terminal subscription, linked to a particular mobile or fixed terminal, or a personal subscription which can be moved between different terminals (mobile and fixed). A number of various services can be linked to each subscription.

3.1.1 Terminal subscription

A terminal subscription is linked to a certain terminal connected to the network. There are two types:

- fixed terminal subscription

- mobile terminal subscription

3.1.2 Personal subscription

A personal subscription is not bound to a particular terminal but can be moved between different terminals, both fixed and mobile.

The services subscribed to by a personal subscription may be limited by the terminal it logs-in to.

When logging-in a personal subscription, the user notifies this to the network with a login message, including a password. The log-in becomes valid when the terminal has received an acknowledgement from the network.

The network considers the subscription logged-in to the stated terminal until the subscription either sends a logout message or logs-in to another terminal.

A physical terminal can have up to 7 personal subscriptions logged-in to it at the same time.

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3.2   SUBSCRIPTION SERVICES

3.2.1   Message traffic

One of the main services in MOBITEX is sending and receiving text and data messages. A message can be a status message, a text message, a data message or a HP-data message with freely coded data.

Messages can be both sent and received by:

* fixed terminal subscriptions
* mobile terminal subscriptions
* personal subscriptions

Group numbers for messages can only receive traffic, not initiate.

If a message does not reach an addressee, e.g. if the addressee's terminal is switched off, the sender is given notification of this. Such messages can be stored in a network mailbox and sent to the addressee when available again.

If more text or data is to be transmitted than can be contained in one message, the transmission must be divided into several sub-messages. The network does not control the order in which the different sub-messages are delivered to the receiver. Such a control must be made by the terminals if needed by the application.

3.2.1.1   Status traffic

Frequently recurring messages such as "available", "engaged", "off to lunch" can be coded to a number which is all that is then transmitted. Thus the transmission time can be reduced considerably. There are facilities for 256 different status messages. Coding of the messages is carried out by the user. Terminals, both fixed and mobile, can be designed to translate the status codes to plain text.

3.2.1.2   Data traffic

Freely coded user data is transmitted in the form of data messages of varying lengths. User data must be formatted to complete octets. A data message may contain up to 512 octets of user data. Coding and decoding of information is determined by the user application.

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3.2.1.3 HP-Data traffic

Data packets to be used when more than 512 octets should be sent and when higher protocols above the Mobitex network layer should be used. Each HP-data packet consists of up to 512 octets of user data.

Two different types of higher protocols can be defined, public protocols and user defined protocols, where public protocols have been registered and assigned a protocol identification number by the network operator. User defined protocols, on the other hand, may be used by a terminal without restrictions.

User data must be formatted to complete octets. Coding and decoding of information, concerning the higher protocol used, is determined by the user and his terminals.

3.2.1.4 Text traffic

Data messages in the form of text, coded according to national standards, are called text messages. This coding permits receiving emergency messages and inter-company traffic.

The maximum text length is 512 characters.

3.2.2 Speech (line-connected traffic)

Speech traffic, which is also referred to as line connected traffic, differs from other types of traffic as a real time link is established between the A and B parties. This connection can then be used for transferring speech or other analogue signals.

Line-connected traffic can be exchanged between:

* fixed terminal subscriptions
* mobile terminal subscriptions
* personal subscriptions

Group numbers for line connection can only receive traffic, not initiate.

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3.2.3 Emergency traffic

Emergency traffic is a common name for

- emergency signal/emergency message,
- emergency acknowledgement,
- emergency connection.

3.2.3.1 Emergency signal/Emergency message

Emergency signals are a type of text message which are sent automatically by the mobile terminal after initiation from an emergency button in or outside the vehicle or from a pocket transmitter when away from the vehicle. The emergency signal may contain up to 256 characters.
A complete emergency message comprises two parts, one fixed part of 256 characters which is stored in the network as subscriber information and one dynamic part which is accessed in the mobile terminal when the emergency signal is initiated. When the emergency signal, together with the dynamic part, has entered the network, the fixed part, stored in the network, is accessed and appended to the dynamic part. The complete emergency message is then sent to the emergency receiver terminal which is stated in the subscriber information of the subscription sending the emergency.

Emergency signals can be given special priority on the radio path, which gives them quicker access than standard messages, when necessary.

The fixed part of the messages stored in the network, coded according to national standards for text code, shall apply to the dynamic part in the mobile terminal.

The emergency message is presented in plain text at the receiving terminal. The emergency message receiver need not therefore have current conversion lists.

Normally, mobile terminals and personal subscriptions logged-in to mobile terminals generate emergency messages. Likewise, fixed terminals and personal subscriptions act as emergency message receivers. In case other requirements are made, any subscription can both generate and receive emergency messages.

When ordering the subscription it is also possible to define an alternative emergency message receiver. The emergency messages will be sent to the alternative receiver when the ordinary receiver manually has ordered emergency messages to be re-directed.

It is also possible to define a rescue centre as, ordinary or alternative, emergency message receiver. This means

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that there will always be someone who takes care of the
emergency message.

3.2.3.2   Emergency acknowledgement

An emergency acknowledgement is a message which is
manually initiated from the emergency receiver.

This is used to give the emergency signal transmitter an
acknowledgement of that the message is taken care of.

3.2.3.3   Emergency connection

A fixed terminal subscription receiving an emergency
message can also initiate an emergency connection. It is
addressed to the subscription which sent the emergency
signal. It can be used to establish a speech connection
between the part initiating the emergency and the
emergency receiver. The network establishes a bi-
directional line connection. The design of the mobile
terminal then determines if the connection is used in
either or both directions.

An emergency connection always has a higher priority than
a normal line connection. This means that a line
connection in progress will be disconnected to the benefit
of an emergency connection at a blocking situation.

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3.2.4 Group traffic

A number of terminal subscriptions can be combined and allocated a common group number in addition to the individual terminal numbers.

The group message will only be sent to terminals in a limited geographical area defined by the stated base radio stations together with the fixed terminals for the group.

Personal subscriptions cannot be included in a group. They can, however, generate traffic to groups.

Subscriptions included in a group receive traffic directed to the terminal number, as well as to the group number to which they belong.

A terminal subscription can belong to up to 15 groups, including the All terminals group.

The group numbers are stored in the terminals, and can be updated from the network.

Group traffic is divided into two types, one for messages and one for line connection.

3.2.4.1 Group traffic for messages

Status, text, data and HP-data messages can be sent to this type of group number.

The message is sent to the fixed terminals and the base radio stations stated for the group number.

This type of message is not acknowledged by the receivers. Thus the sender is not quite sure who has received the message. To increase safety, the message is repeated for a number of times.

3.2.4.2   Group traffic for line connection

Line connection can be requested for this type of group number (e.g. for speech traffic).

Connection concerns the base radio stations and the fixed terminals stated for the group number. There must be at least one base radio station, included in a group.

At the stated base radio stations, the call is transmitted to the group together with a channel change order to a traffic channel. The traffic channel is connected in relay traffic and the mobile terminals can communicate in semi-duplex.

There is no check of which mobile units that have received the call.

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3.3 SUBSCRIPTION FUNCTIONS

Each subscription is characterized by the set of functions (services) which are included, either automatically connected to the type of subscription or optional.

The following table shows possible (P) functions to be launched by each network operator, for fixed, mobile and personal subscriptions.

MOBITEX-function	Type of subscrip.		
	FST	MOB	PERS
Text/HP-data/data traffic	P	P	P
Status traffic	P	P	P
Speech traffic (line conn.)	P	P	P
Password			P
Emergency traffic	P	P	P
Group traffic status/text/data	P	P	
Group traffic speech (line conn)	P	P	
Partially active		P	
Data interruption on line conn.		P	
Mailbox	P	P	P
External networks (telephone, telex, data networks etc. individually optional)	-	P	P

Designations: FST   fixed terminal subscription
               MOB   mobile terminal subscription
               PERS personal subscription

3.3.1   Text/data-traffic

The subscription can send and receive text, HP-data and data traffic. Barring of incoming or outgoing text/data traffic is possible.

3.3.2   Status traffic

The subscription can send and receive status messages. Barring of incoming or outgoing status traffic is possible.

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3.3.3 Speech traffic/line connection.

The subscription can generate and receive a line connection for speech traffic. Barring of incoming or outgoing speech traffic is possible. A mobile terminal requesting a line connection may be put in a queue, where it waits for a radio channel to become available.

3.3.4 Password

Passwords provide protection against unauthorized use of a personal subscription. The network checks when logging in that the correct password according to the subscription information is given. The function is mandatory for a personal subscription.

There is no password for fixed and mobile terminal subscriptions.

3.3.5 Emergency traffic

The emergency service allows the subscriptions listed below to both generate and receive emergency messages. They can also be designated as alternative emergency receivers.

- Fixed terminal subscription
- Mobile terminal subscription
- Personal subscription logged-in at a fixed terminal
- Personal subscription logged-in at a mobile terminal

3.3.6 Group traffic for messages

Only MOB and FST can be included as members in the group and thus accept a group message. All subscription types can generate a message to be sent to group.

3.3.7 Group traffic speech (line connection)

Only MOB and FST can be included as members in the group and thus accept a group connection. All subscription types can generate a group connection.

3.3.8 Closed user groups

A closed user group (CUG) is a group of subscribers who other subscribers can not communicate with. This means that traffic between two subscribers not included in the same CUG is barred by the network.

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All types of subscriptions can be included in a CUG and
the number of members in a CUG is unlimited, i.e. it is
possible for all network subscribers to be members of the
same CUG.

3.3.9   Partially active in MOBITEX

This function means that the mobile terminal can be
partially active in MOBITEX, i.e. it monitors the MOBITEX
network periodically so that it can be used in between
times in another network or can rest to save batteries.

The function means that MOBITEX traffic to the terminal is
synchronized with the sweep signals from the base radio
station, appearing at predetermined times.

The partially active service is only available for 1200-
bps terminals.

3.3.10   Data interruption in a line connection

This function means that if the subscription is engaged in
a line connection, it will be interrupted momentarily for
transmission of any text/data/status messages which are
addressed to the subscription. Only mobile terminals can
have this function (data and speech can be sent
simultaneously to fixed terminals at any time).

3.3.11   Mailbox

The mailbox service means that messages, to a subscriber
who cannot be reached for some reason (e.g. the terminal
is switched off or the personal subscription is logged
out) are stored in a network mailbox.

When sending a message, the sender can state whether it is
allowed to be stored in mailbox or not.

As soon as contact with the subscription is established
again, the messages in the mailbox are sent automatically
to the subscription.

3.3.12   Joint-traffic

The signalling between the base radio station and the
mobile terminals includes a network identification. This
allows different MOBITEX networks to exist in the same
area and in the same frequency band. It also prevents
mobile terminals from unnecessarily changing between
networks (no automatic change of network is allowed).

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When changing network, which is done manually in the
mobile, the frame synchronization is replaced. As a
result, mobile terminals can only receive roaming signals
and other traffic from the network currently selected.

This means that base stations belonging to different
networks transmit different frame synchronization
patterns.

3.3.13   Traffic areas

The signalling between the base radio station and the
mobile terminals includes a also includes an area
identification used to specify geographical areas. Such an
area is denoted as a traffic area and is given a unique
area ID by the network.

A list of area IDs specify the area a mobile terminal may
traffic. Outside the specified area, two possible cases
exist:

1) the terminal is not operational
2) the terminal is operational but may be debited a
    different fee.

When a subscription is registered, the traffic areas the
terminal may operate are defined. These area IDs are
registered in the network subscription record for each
mobile terminal. The area IDs are transferred to the
mobile terminal in an MPAK.

A base station is recognized as a member of a traffic area
by stating the area ID in the frame head. The area ID is
specified by 6 bits. Hence, 64 traffic areas can be
defined within a specific network.

During the roaming procedure, the terminal will primarily
evaluate the roaming signals from bases belonging to the
listed traffic areas. However, other bases may be
considered in the roaming procedure if the terminal is
allowed to traffic the areas outside the specified areas
(see case 2 above). If the terminal lacks a list of area
IDs, the roaming procedure will evaluate all roaming
signals.

The network checks all packets with respect to traffic
areas. If a terminal should try to traffic an area it has
not subscribed to, the packets are returned (case 1) or
forwarded, but with the possibility for the network
operator to use a different fee (case 2).

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3.3.14   External networks

MOBITEX is primarily designed and intended for dispatch
traffic between mobile terminals and their dispatch
offices and between mobile terminals. The facility for
traffic between mobile terminals and other telecom-
munication networks is included as an optional additional
services.

Barring of incoming and/or outgoing access to external
networks, on individual subscriber basis is possible. For
example, fixed subscriptions as well as personal subscrip-
tions logged-in to a fixed terminal, can be blocked for
access to external networks.

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3.4   TRAFFIC LIMITATIONS

3.4.1   Text/data traffic

The maximum quantity of user data in a message is 512 octets. If more data is to be sent, it must be divided into several sub-messages. In this case it is recommended to use the HP data packet type. The network does not control the order in which the different sub-messages are delivered to the receiving terminal.

3.4.2   Line connection

A line connection in progress can be cleared down at any time, by either party and is subject to a time limit, to ensure that call lengths are not excessive. Normally an intermittent "hurry up" tone will be inserted in current line connections before this happens.

A maximum period of time for line connections can be defined. At blocking situations, line connections which have been in progress for more than a specified time may be disconnected one by one for the benefit of new calls.

The line connection can be charged for depending on the way it was disconnected. Either normally within the time limit, after this time limit when the "hurry up" tone is inserted or after the time limit for the "hurry up" tone. This is defined by the network operator.

The traffic limitations described above are booth for line connections between MOBITEX subscribers, and for line connections between a MOBITEX subscriber and a subscriber in an external network.

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4   CHARGING PRINCIPLES

MOBITEX offers a very flexible system for charging of
subscribers.

Mobitex subscription fees can be divided into the
following categories:

- Non recurring fees
- Subscription fees
- Traffic fees

This classification of different fees is motivated by the
demand for flexibility in charging.

The charging principles can be made according to the
operator wishes.

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5 NUMBERING

For addressing subscriptions and groups the network always
uses an address which comprises 24 bits, MOBITEX
subscription number (MAN). This provides 16,777,216
combinations which must be represented by 8 decimal
digits. In purely operative terms the terminals can,
however, be designed to accept abbreviated numbers from
the operator. The terminals must then convert the
abbreviated number to a complete MAN before the network is
called.

A closed user group (CUG) is given an identity which
comprises 16 bits. This provides 65,536 combinations.

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6 NETWORK STRUCTURE

The MOBITEX system comprises a fixed network (base radio stations and exchanges) with connected terminals. The following describes the network structure whereas the terminals are described in a section of their own later on.

6.1 NETWORK HIERARCHY

The MOBITEX network comprises base radio stations (BAS), area exchanges (MOX), main exchanges (MHX) and the network control centre (NCC). These units are called network nodes. The following figure is an example of a possible network configuration:


```
                        ┌─────┐
                        │ NCC │
                        └──┬──┘
              ┌────────────┴────────────┐
           ┌──┴──┐                    ┌──┴──┐
           │ MHX ├────────────────────┤ MHX │
           └──┬──┘                    └──┬──┘
        ┌─────┴─────┐                    │
     ┌──┴──┐     ┌──┴──┐              ┌──┴──┐
     │ MOX │     │ MOX │              │ MOX │
     └──┬──┘     └──┬──┘              └──┬──┘
      ┌─┴─┐      ┌──┴─┐              ┌───┴──┐
   ┌──┴─┐┌┴──┐┌──┴┐┌──┴┐          ┌──┴┐ ┌──┴┐
   │BAS ││BAS││BAS││BAS│          │BAS│ │BAS│
   └────┘└───┘└───┘└───┘          └───┘ └───┘
```
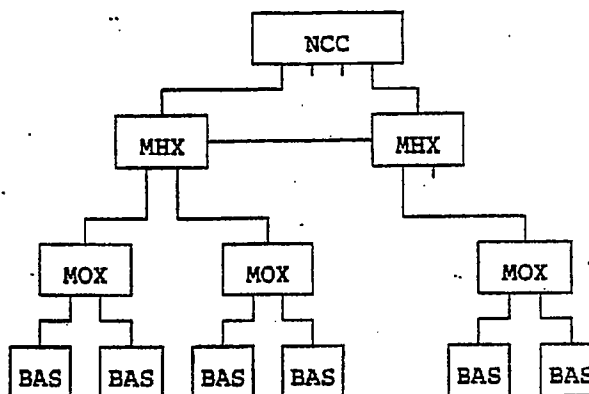
T E R M I N A L S
(MOBILE and FIXED)

The mobile terminals are connected to the network via the radio channels to the base radio stations (BAS). The fixed terminals are connected to the network via fixed connections to the area exchanges (MOX). As the base radio stations and area exchanges comprise the terminal connection points they are designated the "end nodes" in the network.

Traffic handling, i.e. routing of traffic between terminals, is carried out in the network up to and including level MHX. NCC does not take part in the actual traffic handling - it includes an operation and maintenance function and also a subscription information handler function.

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6.2   MAIN COMPONENTS OF THE NETWORK

6.2.1   Base radio stations (BAS)

The base radio stations constitute end nodes for the
mobile terminals. They are also switching points for
vehicle-to-vehicle traffic within the respective radio
coverage areas. They therefore have the necessary
information about the mobile subscriptions within their
radio coverage areas to be able to handle this traffic.
This is necessary for autonomous operation in the event of
a line failure to MOX.

Equipment is installed at the base radio stations for a
number of radio channels. One of these is used for the
system channel whereas the others are used as traffic
channels for speech or data. The number of traffic
channels is determined primarily on the basis of the
anticipated volume of speech traffic.

6.2.2   Area exchanges (MOX)

Area exchanges constitute end nodes for fixed terminals
which are linked to them. They are the switching points
for traffic between base radio stations and fixed
terminals.

The number of area exchanges will depend to a large extent
on the number and distribution of the fixed terminals
throughout the country.

6.2.3   Main exchanges (MHX)

The main exchanges route traffic between area and main
exchanges. The main exchanges could be connected in a
number of various ways, e.g. in a tree or a ring
formation.

It is possible to install main exchanges on several
routing levels for trunking reasons, i.e. to save data and
speech connections.

6.2.4   Network control centre (NCC)

The Network Control Centre (NCC) includes an Operation and
Maintenance function together with a Subscription
information handler function.

This is where the subscription information is entered and
then sent to the main exchanges.

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The charging information is collected by this unit during
periods of low traffic. After totalling, the necessary
basis for accounting is created which can then be sent out
by another administrative system.

The operation and maintenance functions consist of
collecting central alarms and operating statistics, test
function initiation, setting of operating parameters and
program loading of all network nodes.

6.2.5   Connections

The combination of both data and speech connections in
MOBITEX, means that digital transmission systems are
preferable to analog connections between nodes.

For data connections between network nodes; two different
interfaces can be used, either X.21bis together with
ISO/HDLC or X.25.

Where possible, the connection between two nodes can be
split up between different routes, e.g. radio link and
cable or different cable routes.

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7 TRAFFIC ROUTING

7.1 SUBSCRIPTION INFORMATION

Different types of information about the subscriptions are necessary, both static information such as functions included and dynamic information such as which base radio station the mobile terminal is to use.

7.1.1 Static subscription information

Examples of static information:

- type of subscription,

- subscription number,

- services included,

- the address and fixed part of the emergency message,

- group numbers of which the subscription is a member

- technical data such as frequency band and radio channels available in the terminal.

7.1.2 Dynamic subscription information

Dynamic subscription information is such information about the subscription which is often changed. This information deals with roaming, sequence numbers on the radio path, logging-in of personal subscriptions and activation/inactivation status of terminals.

7.1.2.1 Roaming

Information about which base radio station to be used for a certain terminal is kept within the network and is updated by the mobile terminal when moving from one base radio station to another.

7.1.2.2 Sequence numbers

Messages, which are exchanged between a base radio station and a mobile unit, are always given a sequential number by the sender. When roaming to a new base radio station, the old base radio station sends information about the relevant sequence number to the new base radio station together with other subscription information.

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7.1.2.3 · Logging-in of personal subscription

For a personal subscription to be used it must first notify the log-in to the network. This is carried out from the new terminal by sending a log-in message to the end node. The log-in is registered in the terminal as well as in the end node. The relevant base radio station stores information about which terminal the personal subscription is using. If the terminal roams to a new base station, the old base radio station will send information about which subscriptions are logged-in to the terminal.

If a personal subscription logs-in to terminal without having logged-out from another terminal, the previous log-in will be cancelled.

A personal subscription normally disconnect itself with a log-out message.

7.1.2.4   Activate/Inactivate

To avoid unnecessary attempts to call subscriptions which are not active, the terminals must notify the network when they are switched on. Fixed terminals do this immediately after switch on by sending an "active" message. Mobile terminals may delay the "active" message so that activation can be made on possible user traffic exchanged within this time. If no traffic has been exchanged with the mobile terminal within this delay period after switch on, an "active" message is sent to the base station.

When a terminal is switched off, it automatically sends an "inactive" message to the network.

If a mobile terminal loses contact with the network and no traffic has been exchanged within a certain time limit, it will send an "active" message after contact with the network has been reestablished again.

Group traffic messages will not cause an activation.

A personal subscription is activated/inactivated at the same time as the terminal to which it is logged-in.

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7.2   ERROR HANDLING

In a network such as MOBITEX, where the majority of the
terminals are mobile and communicate via radio, a number
of phenomena which cannot be considered as pure faults
occur.

* An acknowledgement of a message can be missed by the
  unit sending the message. This unit then tries again.
  To avoid a copy of the message being displayed, the
  sender (BAS or mobile terminal) allocates a sequential
  number to all messages. Messages with the same
  sequential number as the previous one are deleted by
  the receiving unit (MOB and BAS respectively).

* If a subscriber cannot be reached, the message will be
  returned to the sender or will be placed in a mailbox
  with a message to the sender stating this fact.

7.3   RESERVE ROUTES

The principle is that each node should have a reserve
route to another node in addition to the ordinary node.

If the establishment of a reserve node is unsuccessful,
the cut-off node will convert to autonomous operation as
is described below.

7.4   AUTONOMOUS OPERATION

When contact with a hierarchically superior network node
is lost, messages cannot be forwarded upwards in the
network. Traffic between terminals under the the same
autonomous node will be dispatched as usual.

If a mobile terminal which was not under the node when the
line break occurred roams in, there will be no facility to
receiving traffic information from higher levels in the
network. Technical information can then be requested from
the mobile terminal.

An attempt to log-in a personal subscription is accepted
only if the autonomous node happens to have subscription
information for the subscription concerned.

A base radio station _may_ in autonomous operation send
incoming emergency messages as general messages to all
mobile terminals.

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7.5   TRAFFIC CONTROL AND OPTIMIZATION

The algorithms controlling the access to the radio path
between a base radio station and a fleet of mobile units
are designed to handle all traffic situations. In order to
do so, the traffic in the coverage area of the base
station is monitored to account for short term variations
in the flow of traffic.

It is easily understood that if the major traffic consists
of short "Status" messages, the occupation of the radio
channel is different from a case with long data packets.
Things like this must be taken in account when selecting a
traffic algorithm and setting parameters.

On a short term basis the access to the System Channel,
and optional data traffic channels is controlled at the
base station in order to obtain a high throughput and
lowest possible transmission delays of the packets.

On a long term basis, statistical information derived from
the traffic situation in a certain area may influence such
different issues as installing more radio channels at a
base radio station, raising of data rates on connections
between nodes, opening of new sites for base radio
stations or exchanges etc.

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8 TERMINALS

A terminal is the equipment used for communication with the MOBITEX network. It contains information about subscriptions logged-in to it.

The terminals can be designed according to the users' requirements within wide limits. However, terminals which are to communicate with each other must be adapted to each other e.g. with respect to the coding of data.

8.1 FIXED TERMINALS

8.1.1 General

Fixed terminals are located at offices or dispatch centres and are connected to the MOBITEX network via fixed links. Connection is made to the closest area exchange.

The connection permits text/data traffic and line connection at the same time.

The equipment and the application software at the office is normally adapted to the user's special requirements.

8.1.2 Packet oriented terminals

To implement a communication between these terminals and the MOBITEX network, special MOBITEX packets are used. For the link layer interface a number of different interfaces could be used.

Messages are edited and formatted locally in the terminal before they are sent to the MOX as MOBITEX messages.

This group of terminals contains almost unlimited possibilities for customer adaptation. The equipment can be designed to be used only for MOBITEX communication. But it can also be integrated with other computer systems at the company. The operator can then use the same equipment for MOBITEX communication as for other purposes (e.g. data support for error reports, work planning, transport planning etc.).

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8.1.3   Character oriented terminals

Asynchronous terminals work with only one character at a time. To handle this type of terminal, there are special packet assembly/disassembly units (MPAD) in the network. MPAD contains software which handles the characters from the terminal, processes these and creates messages which can be handled by the MOBITEX network. In this way, inexpensive terminals can be used at offices.

8.2   MOBILE TERMINALS

8.2.1   General

The mobile terminals in MOBITEX are considered as communication interfaces which handle signalling and procedures on the radio path and accept and supply information from and to the user and any additional equipment.

The mobile terminal can be divided into the following functional units:

- radio unit

- control unit

- operator's unit

- peripheral equipment

The functional units can be integrated in different ways in different physical units.

8.2.2   Radio unit

The radio unit contains transmitter and receiver. The traffic method is 2-frequency simplex. Full duplex operation is possible during line connections (speech) except for line connections to groups. However, full duplex operation can be restricted or made impossible by frequency assignments.

The radio unit is controlled entirely by the control unit. The control functions include selection of transmitter and receiver frequencies independent of each other, transmitter on/off, noise limiter on/off, signal strength level, modulation to transmitter and LF from receiver etc.

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Radio units with different HF bandwidths and different frequency setting facilities are permitted in the system. Limitations on these points will however reduce the mobile terminal's traffic facilities in the network, e.g. in the form of higher blocking probability than for a fully fitted mobile terminal. The user himself must attempt to assess these limitations, bearing in mind current and future communication requirements.

8.2.3   Control unit

The mobile control unit (MCU) contains the hardware and software required for radio signalling and to control the different inputs and outputs. These are designed for connecting peripheral equipment such as operator's unit, microphone, loudspeaker, printer, display, key board etc.

8.2.4   Operator unit

An operator unit is necessary for the primary manoeuvring of the mobile terminal. This can be designed in different ways depending on how the mobile terminal is used as a whole. The design can vary from the simplest with on/off switch, volume control, call button and a limited number of status buttons to a complete ASCII keyboard with function keys, perhaps integrated for use with other systems in the vehicle. The operator's unit can also be integrated with a hand set.

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8.2.5 Peripheral equipment

Additional peripheral equipment can be connected to the mobile control unit. Its facilities are determined by the user in his application and his specification of the mobile control unit.

Future changes and developments will be facilitated if MCU is specified with standardized in and outputs.

A few examples of possible additional equipment are:

- paper printer,

- video terminal,

- LCD display,

- emergency receiver for receiving emergency messages from portable emergency transmitters,

- cash terminal,

- holders for code plugs, which can contain personal code numbers, personal emergency messages, login sequences etc.,

- equipment for automatic vehicle location,

- taxi meters,

- computerized systems, e.g. automatic measurement and data systems,

- bar code reader,

- credit card reader.

8.2.6 Serial number control

The electronic serial number (ESN) is stored together with the terminal subscription MAN. The use of this number is meant to protect the mobile terminal from unauthorized use.

The network layer include possibilities for the system to request and receive information about the ESN from a specific terminal.

The ESN of the terminal is checked by the terminal itself at power on.

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9 RADIO PATH

9.1 RADIO FREQUENCIES

9.1.1 Frequency bands and channel numbering

The MOBITEX network is not bound to the use of certain frequency bands or sub-bands or channels with a fixed duplex spacing. This means that a vacant frequency in a frequency band can be assigned to MOBITEX without any major problems in the network. This assumes however that an overall numbering of the frequency channels in the band is established and that the mobile units can traffic any frequency pair in the entire frequency band (wideband stations with full synthesis and 2-frequency simplex without linking between the receiver frequency and the transmitter frequency).

The MOBITEX radio protocol have been proven to work in frequency bands from 80 MHz to 900 MHz.

9.1.2 Channel usage

The base radio stations work in duplex while the mobile terminals work in two-frequency simplex (semi-duplex). However, full duplex operation is possible during line connections (speech) except for line connections to groups.

One or more of the channels are used as system channel(s). The system channels are used both for system messages, e.g. for ordering the mobile terminal to a traffic channel, and for handling data traffic.

In addition to the system channel(s) there are a number of traffic channels at each base radio station which can be used for data or speech traffic.

At most base radio stations, system signalling and data traffic are handled on a system channel and traffic channels are used primarily for speech. At base radio stations with considerable traffic, the mobile terminals can be ordered to traffic channels for data traffic.

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9.2 TRAFFIC CAPACITY

The network throughput for data can be expressed both as a maximum number of packet transmitted over a radio path and as the maximum number of packets a network node can handle per time unit. It is also of interest to express the average forwarding time for a message.

The capacity of the network depends on the software and hardware release version.

The traffic capacity for speech can be estimated by using traditional Erlang calculation based on assumptions of expected average intensities and durations of the calls.

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9.3 RADIO PROTOCOL

9.3.1 GENERAL

The radio protocol described in this chapter consists of a data link layer and a physical layer. It ensures a reliable and efficient transmission path between the mobile terminal and the base radio stations.

9.3.2 RADIO DATA TRANSMISSION SPEED

Both 1200 bps and 8000 bps radio data transmission speed can be used to connect the mobile terminals to the MOBITEX network.

9.3.3 FRAME STRUCTURE

A message is sent in a frame with the following general structure:

Frame header	Primary block	....	Following block #n
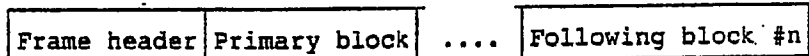
The frame header is included in the frame by the physical layer to establish synchronization. It includes the network identification (i.e the frame synchronization) the base identification number, the area identification and a set of control flags.

To achieve high transmission reliability, the frames are divided into blocks where each block is coded. The primary block contains control information and the address of the mobile terminal.

The network layer information is put in the following blocks, the number of following blocks depends on the amount of information to be transferred.

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9.3.4   BASIC RULES

A mobile terminal with no traffic to send, monitors the system channel. Traffic to the mobile is sent on the system channel, either in the form of a complete message or as a channel change order. After a channel change order, the message is transmitted or a speech connection is established on the new channel.

A mobile terminal with traffic to send awaits a <FREE> signal indicating which terminals have access to the channel. Speech connections must be preceded by a request for channel access.

9.3.5   ADDRESSING AND CHOICE OF BASE RADIO STATION

When a mobile terminal transmits a message it always uses its own subscription number in the primary block. When a mobile receives messages it listens for its own subscription number or a group number to which it belongs.

The base radio station is only addressed in the frame header, using the base identification number. The mobile unit determines itself which base radio station is to be addressed when a call is sent. The choice of base radio station is carried out with the guidance of the reception of roaming signals. The quality of all base stations received is monitored by the mobile unit by counting a weighted number of roaming signals received from each base station.

9.3.6   REPETITION

A message that is not acknowledged by the base station before the next <FREE> signal, is repeated by the mobile terminal. This repetition follows the same rules as the first attempt. The maximum number of repetitions allowed before the transmission is considered as failed is stated in the <SWEEP> signals from the base and defined by network operator.

If the base station gets no response from the mobile terminal within a certain time limit the entire message is repeated. The maximum number of repetitions allowed before the transmission is considered as failed is defined by the network operator.

If the mobile or the base station detects, by a checksum calculation, that one or more of the received blocks are incorrect and cannot be corrected, it requests a repetition of these blocks. These (selective) repetitions are requested until a correct message has been received and acknowledged. Short messages, comprising only a few blocks, are repeated in whole.

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9.3.7 MESSAGE SEQUENCE NUMBERS

Each message to and from a mobile terminal is given a sequential number (0-15) by the sender. A message received with the same sequential number as the one immediately before, is deleted. In this way, a repeated message due to the sending unit not detecting the acknowledgement, will not be presented more than once to the user.

9.3.8 CHANNEL ACCESS ALGORITHMS

To reduce the probability of collisions between mobile transmissions, an access method with time slots is used. This method is based on the slotted ALOHA algorithm.

Spontaneous transmission from a mobile unit must only be made during a free cycle. The base station indicates the start of a free cycle by transmitting a <FREE> signal. The free cycle is divided into slots of equal length. The total number of slots (FREE-SLOTS) and the length of a single slot is stated in the <FREE> signal.

Mobile traffic initiated by the user before the start of the free cycle (MOBILE 1) is distributed at random. A random number generator selects one of the random slots defined in the <FREE> signal (RND-SLOTS). Transmission begins at the start of the selected random slot, if it is still allowed.

```
              <------ free slots -------->
              <-random slots->

BASE  |FREE|        |SIL |ACK1|      |MSG2|      |FREE|

MOBILE1 _____|MSG1|_____

MOBILE2 _____|ACK2|_____
```
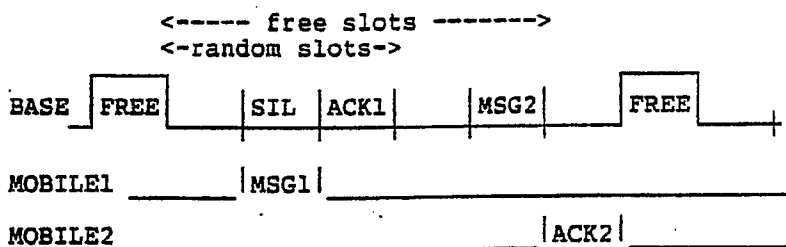
Traffic initiated during the free cycle is sent at the beginning of the next free slot.

If two or more messages collide, the base station may be unable to read them and no acknowledgement will be transmitted. When a new <FREE> signal is sent the mobile units which sent the colliding frames will renew their attempts, this time (individually) choosing a random slot. Before a new <FREE> signal is transmitted, the base station may send an outgoing message (MSG 2 to MOBILE 2).

To prevent a message from being disturbed by transmissions from other mobile units, the base station can transmit a silence signal (SIL) when detecting the start of a

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message. With the silence signal, the base station
withdraws the permission to transmit in the following
slots.

9.3.9   MOBILE FLEET DIVISION

The access permission in the free cycle can be given to
parts (subsets) of the mobile fleet according to the
<FREE> signal to reduce the number of access attempts.

The address and mask fields in a <FREE> signal (or a
<SWEEP> signal) are used for a binary division (1, 2, 4, 8
etc) of the mobile fleet.

In a <FREE> signal, the traffic type parameter gives
access only for messages of the traffic types: emergency,
data and/or speech. This may be changed from the Network
Control Centre (NCC).

9.3.10   SYSTEM SIGNALLING

A system channel is used both for system messages and user
traffic. Periodic sweep signalling is used on all system
channels to set up system parameters, such as the interval
between <SWEEP> signals.

The following figures show some examples of system channel
signalling:
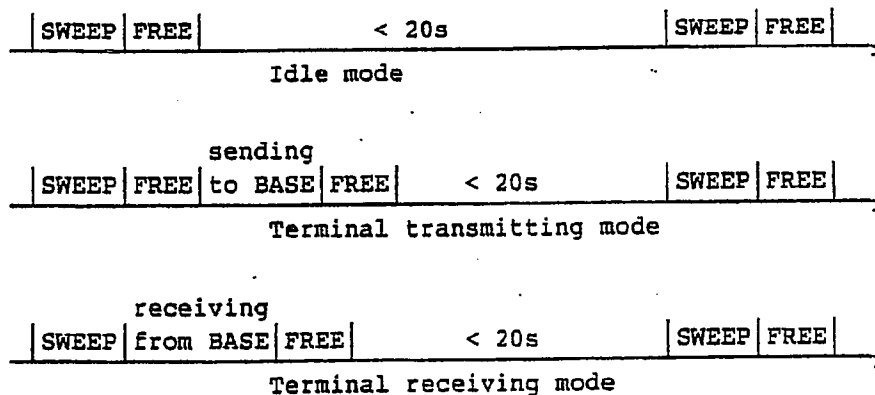
```
|SWEEP|FREE|          < 20s          |SWEEP|FREE|
                                                   ----->
            Idle mode


            sending
|SWEEP|FREE|to BASE|FREE|   < 20s     |SWEEP|FREE|
                                                   ----->
         Terminal transmitting mode


            receiving
|SWEEP|from BASE|FREE|      < 20s     |SWEEP|FREE|
                                                   ----->
          Terminal receiving mode
```

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9.4   TRAFFIC HANDLING ON RADIO CHANNELS

At base radio stations with only a small amount of traffic or during periods of low traffic, the system channel is the only channel open for data traffic.

When the traffic load increases on a base radio station it is possible to open a local system channel by an order from the NCC. The <SWEEP> signals on the system channel then orders parts of the fleet of mobile terminals to the local system channel to reduce traffic on the system channel. A base radio station can operate several local system channels.

If the call intensity from the mobile terminals is too great for a system channel, the base radio station can open one or more access channels. Calls from mobiles are then spread across several channels and the risk of collision is decreased. The <SWEEP> signals on the system channel includes information about open access channels.

A set of channels for each base radio station may be dedicated for speech connection traffic only.

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New Roaming Algorithim:

A new algorithm for roaming and channel software access as been defined by ERITEL for implementation in Mobitex System release R12. This algorithm is considerably different from (and not backward-compatible) the 1200 bps R4B specifications. In quick overview:

* The mobile measures the received signal strength (in dBu V emf) of signals from the base stations instead of counting in ROAM signals.

* The mobiles uses all received frame heads from the base station in its measurement and evaluation, not just ROAM signals.

* A new scanning mode is implemented, for which base stations' system channel must be continuously on. In this mode of operation, the mobile should scan about 10 channels per second.

Normal System Channel Monitoring Procedure:

When the mobile has contact with a base station, it monitors the current system channel, and also scans other system channels given by the network (in the <SVP> frame). the procedure can be diagrammed thus:

```
<SVP>                                                           <SVP>

|
|mmmmmmmmmmmmmmmmmmmmmmmmmm|sssssssssssssssssssss|mmmmmmmmmm |
|                                                                e
```

where "mmmmmmm.." means monitor the current system channel
"sss..." means scan other system channels(s), and "e" means
evaluate the received signals.

The length of the period during which the mobile monitors other system channels is given in the <SVP> frame as SCAN-TIME. The starting time of the "sss.." sequence is different for different groups of mobiles, based on their having an odd or even MAN. as follows:

scan start (odd) = TIME TO NEXT - 10ms - 2* SCAN TIME
scan start (even) = TIME TO NEXT - 10ms - SCAN TIME

where TIME TO NEXT is the time to the next <SVP>, as given in the last <SVP> frame.

The mobile has two different ways to evaluate system channels other than the current system channel – FRAME MODE and CONTINUOUS MODE. Which mode the mobiles should use is given in the <SVP> frame as RSSI_PROC.

* In FRAME MODE, the mobile measures the signal strength during all frame heads. This mode is similar to that used for monitoring the current system channel. In this mode the mobile has to stay on the same channel for approximately one second (and perhaps longer) in order to receive at least one frame head. The length of time over which to make measurements is given in the <SVP> frame as RSSI_PERIOD.

* In CONTINUOUS MODE, the mobile measures the signal strength during a short period (typically 100ms) on each channel. Here, the mobiles do not care whether it receives frame heads or any other type of traffic; it is measuring the carrier, which must be continuously on. Note that in this mode, the mobile does not initially know the identity of the base station whose signal it is monitoring, since it is not reading frame heads.

Quick Scanning Procedure:

When a mobile loses contact with the network it enters a "quick scanning" mode. In this mode the mobile monitors each likely channel for a short period. The channels are scanned in the following order:

1. The channels in the current (neighbour) list given in the <SVP>.
2. The channels in the current list stored in PROM.

At the system operator's discretion, the default list may be temporarily replaced by a shorter list (called the "temporary default list") of system channels in the mobile's usual operating area.

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The mobile scans "n" channels from the above scheme (where "n" is a number defined by the system operator - typically 10), and then monitors the last used system channel again. It then scans "n" new channels from the lists and returns to the last used system channel, and so on. When all the channels from both the lists have been scanned, cycling repeats over the default list only with periodic returns to the last used system channel. When a measured channel has a satisfactory signal strength (as given by GOOD_BASE in the <SVP>), the mobile continues to evaluate this channel for a few seconds (typically 3) before finally selecting it as the new system channel. In the case of CONTINUOUS MODE operation, the mobile must at this point acquire and examine one or more frame heads in order to determine whether or not it has evaluated a valid system base station.

If the mobile is able to use the CONTINUOUS MODE of scanning as described above, the scanning of each channel takes about 100 ms (including channel switching time). The last used system channel is therefore examining every second and the recovery time from a temporary cutoff (tunnel, elevator, garage, etc.) is reduced dramatically . If the system operator has chosen to use the FRAME MODE method, the time for getting back to the last used system channel is still much shorter for the old (R11) method, but significantly longer than for CONTINUOUS MODE operation.

Criteria for Leaving the Current Base:

The mobile leaves the current system channel and starts the roaming procedure in four cases:

1. The signal level of the current base is too low (below the values of BAD_BASE from the <SVP>).

2. Another base (BEST_BASE) has a signal strength that is higher than that of the current base, and the difference is greater that the value BETTER_BASE given in the <SVP>. This is typically 10-15 dB. Before the move takes place, the signal strength from "BEST_BASE", averaged from frame heads measured during the next sweep period, still must fulfill this criterion.

3. The mobile has made MAX_REP retransmissions without receiving an acknowledgement from the base. MAX_REP is also given in the <SVP> frame.

4. The mobile has not received a valid <SVP> frame within two <SVP> periods.

Summary of information in the <SVP> frame:

The following information relating to the roaming procedure is provided to the mobile within a <SVP> frame (subtype 1):

RSSI_PROC - states the method of the signal strength measurement.
0= FRAME, 1 = CONTINUOUS. The default is FRAME.

RSSI_PERIOD - The time used by the roaming algorithm, over which to average received signal strength.
(0-255) * 20 ms. The default is 2960 ms.

SCAN_TIME - The length of the period during which the mobile scans other system channels.
(0-255) * 100 ms. The default is 3000 ms (3 seconds).

BAD-BASE - The signal strength from the current base that is just satisfactory for use.
(0-255) dBuV emf. The default is 15 dBuV emf.

GOOD_BASE - A satisfactory signal strength to accept for a new base selection as current base.
(0-255) dBuV emf. The default is 15 dBuV emf.

BETTER_BASE - The signal strength improvement in dB, above which the mobile should switch to a new base from the current base.
(0-255). The default is 10 dB.

TIME_TO_NEXT - The time in seconds to the next <SVP> frame.
(0-255). The default is 10 sec.

MAX_REP - The maximum number of repetitions allowed for unacknowledged messages.
(0-255). The default value is set by the system operator. Cantel's default value is 5.

Other Information:

The RSSI signal from the mobile transceiver should be able to indicate signal strength over the range 0-50 dBuV emf. OdBuV emf corresponds to 113dBm (assuming 50 ohm impedance). The time constant of the RSSI signal from the transceiver should be 1 ms, and the mobile should sample the RSSI signal with a frequency of 1000 samples per second and obtain the samples from which to derive average RSSI.

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References:

Chapter 6 discusses scanning procedures in more detail.

Chapter 16 pages 17-23, discusses the roaming procedure in more detail.

Chapter 18 page 17, gives information on the signal strength indication to be provided by the mobile receiver. See also page 14 of chapter 17.

The <SVP> frame is detailed in Appendix A of Chapter 16, pages 28-34.

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Benämning		Title
Cantel Mobitex ~		MOBITEX Terminal specification General description of terminals

SUMMARY

To the MOBITEX network fixed and mobile terminals can be connected.

Fixed terminals are connected via a line interface whereas mobile units are connected by a radio interface. Layer division has been applied to the definition of the terminal's functions.

The upper layers are common to both types of terminals whereas the lower layers are available in two versions, one for fixed terminals and one for mobile terminals.

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1 INTRODUCTION

1.1 GENERAL

The term terminal refers to a physical unit which can be connected to the MOBITEX network.

There are two types of terminals:

- Fixed terminals which are connected via separate line interfaces for data and voice.

- Mobile units which are connected via a radio interface.

Communication through the network is done with packets for both terminals. The designation message (MPAK) for this packet also appears in the set of documents.

The MOBITEX network

Radio interface
< - - - - - >

Base radio station

Mobile Terminal

Line interface

Area ex- change

Fixed terminal

Data

Voice

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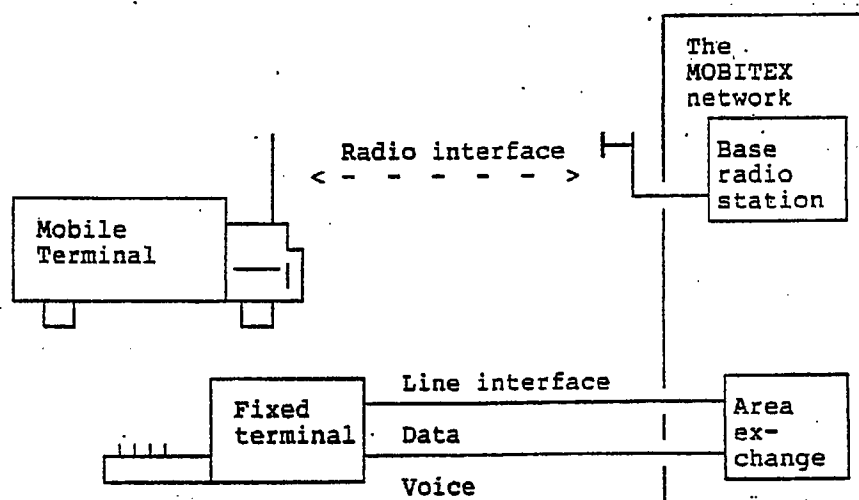
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1.2   DIVISION INTO LAYERS IN MOBITEX
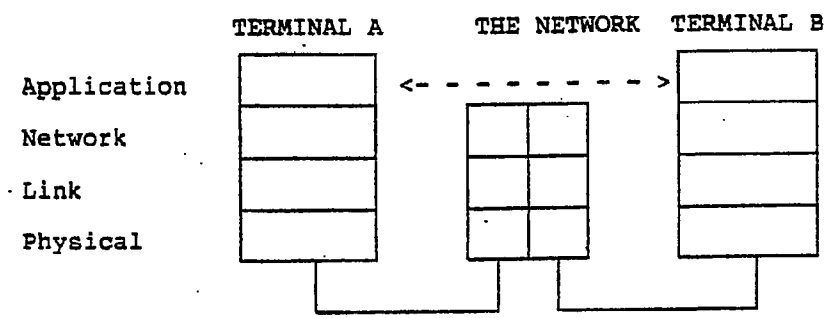
The physical layer and the link layer separate the terminals. The network layer is identical for both types of terminals. In the superior layer, the application layer, MOBITEX makes demands on the handling of certain addressing methods. The requirements which are demanded in the application layer are identical for both types of terminals.

In certain applications, the peripheral equipment is connected to the terminals. We recommend certain interfaces for connection to such equipment. See reference R1-19 for further information.

A terminal with peripheral equipment connected can be symbolized according to the following model:
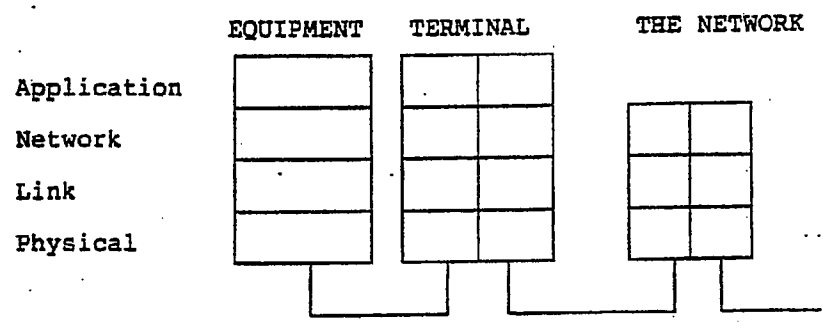
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2 FIXED TERMINALS

A fixed terminal is connected via a line interface and a voice interface to the MOBITEX network. The terminal communicates with exchanges which constitute the network's end nodes for fixed terminals.

3 MOBILE TERMINALS

A mobile terminal is connected via a radio interface to the MOBITEX network. The terminal communicates with base radio stations which constitute the network's end nodes for mobile terminals. It is up to the mobile terminal to select which base radio station to belong to at the particular time by continuously listening for addresses for adjacent base radio stations.

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4 MOBITEX TERMINAL SPECIFICATION REFERENCE LIST

This document includes a number of references, made to other sections in the terminal specification. The list below shows these references, together with the page(s) they are made on. Please note that a section could be referred to several times on the same page.

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Below are the reference designations listed.

Reference	Section
R1-01	Arrangement of the documents
R1-02	MOBITEX System description
R1-03	General description of terminals
R1-04	Terminology
R1-05	References
R1-06	Network operator information
R1-08	Application layer
R1-09	Network layer
R1-11	Interface requirements, fixed terminals
R1-12	Other requirements, fixed terminals
R1-16	Link layer, mobile terminals
R1-17	Physical layer, mobile terminals
R1-18	Radio equipment, mobile terminals
R1-19	Other interfaces, mobile terminals
R1-20	Other requirements, mobile terminals

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LIST OF ACRONYMS
USED IN SPECIFICATION

Most of the acronyms used in the Mobitex Documentation are of Swedish origin. For convenience of readers all these acronyms have been listed alphabetically and a pertinent explanation provided. The most common are described in this documentation with English acronyms, therefore whenever there is a risk of misunderstanding, use this guide for translation/explanation.

Swedish/English Acronym	Explanation
AAT	Change access request, speech
ABD	Access request, data
ABL	Access request, emergency
ACT	Access request, speech
ACK	Acknowledgement
AKT	Activity request
ANS	American National Standard Institute
ASCII	American Standard Code for Information Interchange
ATD	Access permission, data
ATL	Access permission, emergency
ATT	Access permission, speech
BASE	Radio Base station
BBT	Change base station, speech
BKD	Change channel, data
BKE	Base station control unit
BKT	Change channel, speech
BMON	Base Contact Monitoring
BPSK	Binary phase shift keying
CODE	Coding and Readout
DCOD	Input and decoding
EBC	Computer rack
EBR 8/900	Radio rack
EEPROM	Electrically Erasable PROM
FRI	Free Signal
FST	Fixed terminal subscription
GMSK	Gaussian minimum shift keying
HDLC	High-level data link control
IFRA	Processing Incoming Frame
ISI	Intersymbol interference
ISO	International Standards Organization
KKE	Channel control unit
LKE	Line concentrator unit

Swedish/English Acronym	Explanation
LSB	Least Significant Bit
MAN	Terminal subscription number
MASC	Mobitex asychronous communication protocol
MCU	Mobile control unit (as part of modem)
MFL	Personal subscription
MI	Modulation Index
MOB	Mobile terminal subscription
MOX	Local exchange
MPAD	Mobitex packet assembly/disassembly
MLE	MOX line concentrator unit
MOA	Mobitex Operator Association
MPAK	Mobitex packet
MRM	M-Frame
MSB	Most Significant Bit
MSE	MOX control unit
MX	Main exchange
NACK	Negative acknowledgement
NAM	Number assignment module
NAT	No access permission, speech
NCC	Network control center
NSC	National system channel
OCTET	Byte (8 bits)
OFRA	Processing Outgoing Frames
OSI	Open System Interconnect
PADS	X.25 packet assembler/disassembler
PAHA	Packet Handling
PERS	Personal Subscription
POT	Plain Old Telephone
PROM	Programmable read-only memory
PS	Personal Subscription
RACK	Request for repetition of the last sent ACK
RAM	Random Access Memory
REB	Repetition Request
RES	Repetition Reply
RMD	RAM Mobile Data
ROSI	Radio Signalling Protocol (RSP)
RSSI	Radio Signal Strength Indication
SACK	SENS Achnowledgement
SENS	Link Layer Control
SVP	Sweep Signal

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Swedish/English Acronym	Explanation
TEL	Public switched telephone network com. unit
TST	Silence order
UTG	Mobile Unit Output Port Identifier
VCO.	Voltage controlled Oscillator
VKT	Wait for channel, speech

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LIST OF ABBREVIATIONS USED IN
SPECIFICATIONS

SWEDISH/ENGLISH	EXPLANATION
ACTIVE	Terminal active
ADDCONFAST	Conn. Req. w\additional info fast
ADDCONREQ	Conn. Req. w\additional info
AREALIST	List valid area IDs
BORN	Terminal active for the first time
CLOOPOFF	Circuit Loop Test End
CLOOPON	Circuit Loop Test Start
CONFAST	Connection Request Fast
CONGRA	Connection Request Granted
CONORD	Connection order for group call
CONREA	Ready for connection
CONREQ	Connection Request
CSUBCOM	Circuit switching for subscriber and emerg/comm.
DIE	Term. not permitted to send use traffic
DISCON	Disconnection of connection
DTESERV	Data Terminal Service Communication
ESNINFO	Electronic Serial Number Information
ESNREQ	Electronic Serial Number Request
EXTCONREQ	External Connection Request
FLEXLIST	List of personal subscription MAN's
FLEXREQ	List of Pers. Subscription MAN request
GROUPLIST	List of Group MANs
INACTIVE	Terminal not active
INFO	Terminal Information
INFOREQ	Terminal Information request
LINEOFF	Line Connection Off
LINEON	Line Connection On
LINSEL	Line selected
LIVE	The terminal may send packets again
LOGINGRA	Login Request Granted
LOGINREF	Login Request Refused
LOGINREQ	Login Request
LOGOUT	Logout
LOGOUTORD	Logout order
MPAK	Mobitex Packet
PSOSCOM	Packet switched emergency communication
PSUBCOM	Packet switched subscriber communication
ROAM	Roaming Message
ROAMORD	Roaming Order
SOS	Emergency signal

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SWEDISH/ENGLISH	EXPLANATION
SOSACK	Emergency Acknowledgement
SOSCONFAST	Emergency Connection Request Fast
SOSCONREQ	Emergency Connection Request
SOSRX	Cancel Emergency re-direction
VICESOSRX	Re-direction of emergency messages.

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Benamning		Title MOBITEX Terminology and abbreviations		

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SUMMARY

This document includes the terminology and abbreviations used in the terminal specification.

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1 TERMINOLOGY

The following list gives certain specially defined terms used in the MOBITEX Terminal Specifications.

The terms are listed in alphabetical order.

A-PARTY   The originating unit of the message or the line connection. i.e. the calling part.

AREA EXCHANGE   MOBITEX area exchange. Constitutes the end node for fixed terminals.

B-PARTY   The intended receiving unit of the message or the line connection, i.e. the called part.

BASE RADIO STATION A base radio station is a network node which constitutes a link between a number of mobile terminals and the MOBITEX network. A base radio station transmits traffic on one or more radio channels.

CIRCUIT SWITCHED   A circuit switched connection or line
CONNECTION OR   connection is a real time connection
LINE CONNECTION   between terminals.

                       The traffic over a line connection is normally speech communication.

EXTERNAL NETWORK   In the MOBITEX network there are special gateways to other public networks such as the datex network, the telex network and the data packet network.

FIXED TERMINAL   A fixed terminal is equipment connected to MOBITEX by a leased line connection.

                       The equipment possesses a Fixed Terminal Subscription and can also belong to one or several group numbers. In addition, one or more transferable subscriptions can be logged in to the terminal.

MAIN EXCHANGE   MOBITEX main exchange. Connects the area exchanges.

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MOBILE TERMINAL   A mobile terminal is equipment
connected to MOBITEX via a radio path
to a base radio station.

The equipment possesses a Mobile
Terminal Subscription and can also
belong to one or several group
numbers. In addition, one or more
personal subscriptions can be logged
in to the terminal.

MOBITEX TEXT CODE   Coded character set for the data
interchange, according to national
standard.

NETWORK CONTROL CENTRE
Consists of a subscription handler
part and a operation and maintenance
part.

USER TRAFFIC   User traffic is the messages
transmitted between terminals
connected to MOBITEX. There are user
messages with different characterist-
ics. These are differentiated
according to different traffic types.

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2   ABBREVIATIONS

The following abbreviations are used in MOBITEX terminal
specification. Most of the abbreviations are explained in
the terminology chapter.

BAS	Base radio station
FST	Fixed terminal
MAN	Subscription number
MHX	Main exchange
MOB	Mobile terminal
MOX	Area exchange
NCC	Network control centre
PERS.	Personal subscription

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Dokansv Godkänd Docrespons approved ET/SYSC STT		Datum Date 1990-02-16	Rev E	Tit File MTS05.1
Benämning		Title MOBITEX Terminal specification References	

Cantel Mobitex

INTRODUCTION

The reader should have a number of documents and
publications at hand, referred to in the terminal
specification. This document lists the necessary
references.

Note: Internal references, i.e. to other sections in the
Terminal specification, are described in section
Arrangement of the documents.

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1 CCITT RECOMMENDATIONS

The following CCITT recommendations are referred to in this set of documents:

V.10   Electrical characteristics for unbalanced double current interchange circuits for general use with integrated circuit equipment in the field of data communications.

V.11   Electrical characteristics for balanced double current interchange circuits for general use with integrated circuit equipment in the field of data communications.

V.24   List of definitions for interchange circuits between data terminal equipment and data circuit terminating equipment.

V.28   Electrical characteristics for unbalanced double current interchange circuits.

V.52   Characteristics of distortion and error-rate measuring apparatus for data transmission.

X.1   International users of service in public data networks.

X.21'' (X.21 bis) Use on public data networks of data terminal equipment (DTE) which is designed for interfacing to synchronous V-series modems.

X.24   List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit terminating equipment (DCE) on public data networks.

X.25   Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit.

X.26   (Refer to V10)

X.27   (Refer to V10)

The above recommendations are found in:

CCITT Recommendations Volume VIII (Fascicle VIII.1 - VIII.3) from VIIth Plenary Assembly 1980 (Yellow Book).

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In addition, there are references to the following CCITT
recommendations:

P.53 A   Psophometers, apparatus for the objective
          measurement of circuit noise.

          . CCITT Recommendation Volume V (Telephone
          transmission quality) from VIIth Plenary Assembly
          1980 (Yellow Book)

2   OTHER INTERNATIONAL STANDARDS

ISO 646   Data representation – coded character
                         set for the data interchange.
                         National additions to be used are
                         stated in reference R1-06.

ISO 2110   Data communication – 25 pin DTE/DCE
                         interface connectors and pin
                         assignments.

ISO 3309-1984 (E)   Data communication – High-level data
                         link control procedures – Frame
                         structure.

ISO 4335-1984 (E)   Datacommunication – High-level data
                         link control procedures – Elements of
                         procedures

ISO 4903-1980 (E)   Data communication – 15 pin DTE/DCE
                         interface connectors and pin
                         assignments.

ISO 7809-1984 (E)   Information processing systems – Data
                         communication – High level data link
                         control procedures – Consolidation of
                         classes of procedures.

GA27-3004-2   IBM General Information – Binary
                         Synchronous Communication.

CEPT Recommendation T/R 24-1
                         Recommendation for Radio equipment
                         (Only a draft is available, at the
                         time of publishing of these
                         specifications.)

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3   NATIONAL REGULATIONS FOR RADIO EQUIPMENT

Regulations to be used for national type approval are
stated in reference R1-06.

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4 MOBITEX TERMINAL SPECIFICATION REFERENCE LIST

This document includes a number of references, made to
other sections in the terminal specification. The list
below shows these references, together with the page(s)
they are made on.

R1-06, 4, 5,

Below are the reference designations listed.

Reference	Section
R1-01	Arrangement of the documents
R1-02	MOBITEX System description
R1-03	General description of terminals
R1-04	Terminology
R1-05	References
R1-06	Network operator information
R1-08	Application layer
R1-09	Network layer
R1-11	Interface requirements, fixed terminals
R1-12	Other requirements, fixed terminals
R1-16	Link layer, mobile terminals
R1-17	Physical layer, mobile terminals
R1-18	Radio equipment, mobile terminals
R1-19	Other interfaces, mobile terminals
R1-20	Other requirements, mobile terminals

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Cantel Mobitex

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Network Operator Information (Canada)

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1. INTRODUCTION

This chapter includes requirements that are specific to the design of equipment for use on the Cantel Mobitex network in Canada. They also apply to Equipment to be used in the United States on either a "roaming to U.S. basis", or on a subscription in the U.S.

The sections headings in this chapter describe technical requirements, which are either brand new, or have been touched briefly in other chapters of the specification, and cross referenced to this Chapter 6 for a more detailed explanation.

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2. CANTEL NETWORK ASPECTS

This section specifies the network capabilities and parameters that are specific to the Cantel Mobitex network.

2.1 SUBSCRIPTION FUNCTIONS SUPPORTED

The subscription functions supported by Cantel are as indicated in the following table:

	Subscription Type		
Mobitex-Function	FST	MOB	PERS
Text/Data-Traffic	*	*	*
Status Traffic	*	*	*
Password			*
Alert Message Service	*	*	*
Group Traffic/Text/Data	*	*	
Mailbox	*	*	*
External Networks		*	*

Designations: FST = Fixed Terminal Type
MOB = Mobile Unit Type
PERS= Personal Subscription

2.1.1 ALERT MESSAGE SERVICE

Alert Message traffic may be generated or received by any subscription type (fixed terminal, mobile unit, personal login at fixed terminal, and personal login at mobile terminal). Any of these subscription types may also be designated as an alternative Alert Message Receiver.

2.1.2 MOBITEX TEXT CODE

The text code used for TEXT TRAFFIC and EMERGENCY MESSAGES in the Mobitex Network is ANSI X3.4-1977 (which is derived from ISO 646 with national extensions). Each character is represented by one octet consisting of the 7-bit ANSI X3.4 code with the eighth bit set to zero.

2.2 MAN NUMBERING PLAN

The Mobitex network subscription address is based on a 24-bit number known as the MAN number.

The MAN numbering plan for Cantel is partitioned as follows:

MAN Number	Usage
0	Not used
1	MOBITEX Network
2 - 6	External Networks
7	All Terminals MAN
8 - 20	External networks
21 - 99,999	Reserved for future use
100,000 - 16,777,215	Subscriptions and groups

Specific assignment of External networks will be determined later.

The MAN range allocated to subscription (>100,000) will be further partitioned to facilitate network administration and joint traffic with other Mobitex networks.
Cantel will use MAN numbers in the range 2,000,000 - 2,999,999.

2.2.1 JOINT TRAFFIC

Unique frame synchronization patterns are assigned to each Mobitex network (see Sect. 4.1), so as to preclude automatic switching between networks. However, mobile terminals intended for use in both the US and Canada must be designed to allow manual switching between the RMD and CANTEL networks. This network switching capability requires that the mobile unit permanently store all required synchronization patterns. Multiple channel default lists must also be accommodated in such mobile terminals.

Actual internetworking between RMD and CANTEL is planned to be implemented at some future date.

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2.3   HP-DATA PROTOCOLS APPROVED BY MOA

The network allows up to 255 different higher level protocols for use with HP-Data. Protocols 1-127 will de defined by MOA and supported as needed by Cantel. At the present time, no HP-Data codes have been assigned. Protocols 128-255 are free to be defined on a per application basis.

2.4   NETWORK MESSAGES

Messages received by the mobile terminals include a "traffic state". For all non-zero states, it is required that both the decimal value (0-7) and the "traffic state" and its meaning be presented to the user in plain English text as indicated in R1-09 (Sect. 3.2.3) and R1-08 (Sect. 2.5)

2.5   CHARGING PRINCIPLES

The Canada tariff for users of the Mobitex network is stated elsewhere and is not part of this specification.

2.6   ACCEPTANCE TESTING

Equipment to be used on the Cantel Mobitex network will be tested by Cantel in this specification, and certified as satisfactory for use on the network.

3.   FIXED TERMINAL INFORMATION

3.1   BIT RATES AND PROTOCOLS FOR FIXED TERMINALS

The bit rates for different fixed terminals interfaces supported by the network for different standard protocols is as follows:

Terminal Interface: Supported Bit Rates (Kbps):

HDLC	2.4, 4.8, 9.6,
X.25	2.4, 4.8, 9.6,
MASC	1.2, 2.4

3.2 ELECTRICAL REQUIREMENTS

Fixed terminals shall be designed to operate with standard line voltages found in Canada.

Fixed terminal equipment that operates from AC power must meet all relevant CSA regulations, be tested by the CSA and bear a specified CSA label.

3.3 SPECIFICATION OF LINE CONNECTION

Access lines between fixed terminals and the Mobitex network will generally be provided by a third party telecommunications vendor. Fixed terminals and associated data communications equipment will necessarily meet the specifications of these telecommunications vendors.

4 MOBILE TERMINAL INFORMATION

4.1 NETWORK IDENTIFICATION NUMBER

Network identification makes it possible to have different Mobitex networks operating in the same area, on the same frequency band, without arbitrary and uncontrolled roaming of mobiles and portable units between base stations on the different networks. (For example, RAM Mobile Data in the U.S. and CANTEL in Canada will have Mobitex networks in the same 900 MHz SMR band, and uncontrollable roaming between these two networks is undesirable.) The particular network within which unit is to operate is specified by means of the frame synchronization pattern of the frame head in the physical layer of the radio protocol (bits 17-32). These pattern are assigned and administered by the Mobitex Operators' Association (MOA). The patterns are specified below.

ID NUMBER	ORIGINATOR	BIT NUMBER 01......16	NETWORK
1	Mobile/Port. Base	1100010011010111 1100010011010111	CANTEL, Canada
2	Mobile/Port Base	1011010000110011 1011010000110011	RMD, U.S.

The identification number to be used by the mobile unit may be selected by a switch on the unit or by other means.

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4.2 AREA IDENTIFICATION NUMBER

The area identification number is also a part of the frame head In the physical layer (bits 39-44), and is used to designate a particular group of base radio stations in a particular operating area of the Cantel Mobitex network. A maximum of 14 operating areas will be defined in Cantel Mobitex network. The mobile must be capable of storing an "operation allowed" list of these numbers in non-volatile memory. The binary area identification "0" designates ability to operate in all areas of the network. Area identification "256" excludes the mobile from operation in any area, i.e. it is in monitor mode only.

Specific operating areas will be designated and identified at a later time.

4.3 ELECTRONIC SERIAL NUMBER

Electronic Serial Number (ESNs) are used as a security measure in mobile and portable units to protect the system from unauthorized use and to help identify stolen equipment. A unique and unalterable ESN must be permanently affixed to the chassis (case) of each individual mobile and portable unit manufactured for use with the Cantel Mobitex Network. Before a mobile unit is accepted by the network, it transmits its electronic serial number (as part of the BORN message) to the network, where it is checked against the serial number stored there in association with the MAN.

The format of the ESN, which is also transmitted as part of ACTIVE and ·ROAM messages from the mobile, is as follows.

```
MSB                                        LSB
32..............25    24...........19    18....................1


  |          |        |         |        |           |
  |Mfg.Code |        .|Reserved|        |Serial number|
```
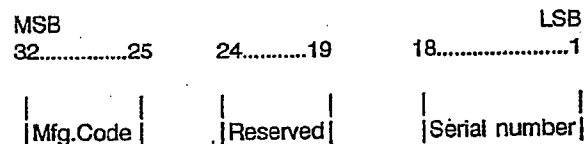
The 32-bit ESN is divided into three fields, with bit 1 the least significant bit (LSB) and a bit 32 the most significant bit (MSB). There is an 18-bit serial numbers field (bits 1-18), a 6 bit reserved field (bits 19-24), and an 8-bit manufacturer's code field (bits 25-32)

The manufacturer's code will be assigned by Cantel. The manufacturers may subdivide their serial number fields for their own convenience; a total of 262,144 combinations are available. The reserved field is for future use to provide additional capability for the serial number of model number representation. Manufacturers may wish to apply for additional ESN space at a later time; until then, the reserved field should be set to zeros.

The ESN is included in octets 9 through 12 of the BORN, ACTIVE and ROAM messages. The MSB of the ESN is bit 8 of octet 9, and the LSB is bit 1 of octet 12. The ESN must also be furnished by the mobile in an ESNINFO message, in response to an ESNREQ message from the network.

4.4 RADIO FREQUENCIES

This section contains radio parameters (frequency plan, channel numbering and system channels) specific to the Cantel network.

4.4.1 DEFINITION OF FREQUENCY BAND

The frequency band information is the band in which the mobile terminal is working. The Frequency Band Information (FBI) designation for Cantel is:

FBI = 4, which corresponds to 900 MHz and 8k bps.

This information is used by the network when the mobile terminal sends MPAK INFO to the network.

Further Information: R1-09

The base station uses the frequency band information in certain radio frames.

Further Information: R1-16, Appendix A, Frames

4.4.2 DEFINITION OF TERMINAL TYPES

The terminal type information is used to separate terminals with different functionality.

The Terminal Type Information (TTI) associated with Cantel is:

TTI = 3, meaning terminal type 3

This information is used by the mobile terminal when sending MPAK INFO to the network.

Further Information: R1-09

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4.4.3. CHANNEL NUMBERING AND FREQUENCY PLAN

The radio channels used for Mobitex communications between mobiles and base stations are allocated by the DOC from 896-901 MHz band for mobile transmit and from the 935-940 MHz for base station transmit(mobile receive). Each mobile transmit is paired with a base station transmit channel exactly 39 MHz higher in frequency. Thus whenever a base communicates with a mobile, and transmits for example on 936.2625 MHz (Channel 3701, which is the first channel in Group F), the mobile must transmit to that base station only on 897.2625 MHz, which is Channel 581 and is precisely 39 MHz lower in frequency.

Figure F-1 shows the channel number, the base station transmit frequency, and the mobile transmit frequency, within this allocation. It also shows a letter designation indicating the block to which each channel belongs. The channels within any group are spaced exactly 12.5 Khz apart. The frequency of a channel may be calculated by the formula.

$$\text{Frequency in MHz} = 890 + 0.0125 \text{ (channel number)}$$

Note that the channel numbers given in Figure F1 have been assigned by ERITEL and are known as "Mobitex Channel Numbers". They do not correspond to channel numbers assigned by the DOC or the FCC in the United States. However, since the Mobitex system will communicate frequency information to mobile and portable units by using the Mobitex Channel Numbers, these channel numbers must be recognized and associated with the corresponding frequencies by the units.

It is important to note that although current Cantel MOBITEX frequency plan associates transmit and receive frequencies and channel numbers in fixed pairs (the paired frequencies are 39MHz apart), the design of the mobile unit transceivers should not preclude the use of transmit and receive frequency pairs with various frequency separations. In the future, it is not unlikely that mobile units will be required to operate with transmit/receive frequency pairs selected from any of the allowable frequencies in Figure F1 in order to permit optimization of overall system performance under various circumstances.

4.5 RADIO EQUIPMENT

4.5.1 NATIONAL REGULATIONS

Mobile Terminals must comply with all regulations published by the Department of Communications relating to equipment used in this service. This includes, but is not limited to RSS 122. A manufacturer must design the equipment to or in excess of these radio standard requirements.

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Figure F-1
Channel Numbering Plan

BLOCK A

Chann.	MOBILE Freq.	BASE Chann.	STATION Freq.
481	896.0125	3601	935.0125
482	.0250	3602	.0250
483	.0375	3603	.0375
484	.0500	3604	.0500
485	.0625	3605	.0625
486	.0750	3606	.0750
487	.0875	3607	.0875
488	.1000	3608	.1000
489	.1125	3609	.1125
490	.1250	3610	.1250

BLOCK B

Chann.	MOBILE Freq.	BASE Chann.	STATION Freq.
501	896.2625	3621	935.2625
502	.2750	3622	.2750
503	.2875	3623	.2875
504	.3000	3624	.3000
505	.3125	3625	.3125
506	.3250	3626	.3250
507	.3375	3627	.3375
508	.3500	3628	.3500
509	.3625	3629	.3625
510	.3750	3630	.3750

BLOCK C

Chann.	MOBILE Freq.	BASE Chann.	STATION Freq.
521	896.5125	3641	935.5125
522	.5250	3642	.5250
523	.5375	3643	.5375
524	.5500	3644	.5500
525	.5625	3645	.5625
526	.5750	3646	.5750
527	.5875	3647	.5875
528	.6000	3648	.6000
529	.6125	3649	.6125
530	.6250	3650	.6250

BLOCK D

Chann.	MOBILE Freq.	BASE Chann.	STATION Freq.
541	896.7625	3661	935.7625
542	.7750	3662	.7750
543	.7875	3663	.7875
544	.8000	3664	.8000
545	.8125	3665	.8125
546	.8250	3666	.8250
547	.8375	3667	.8375
548	.8500	3668	.8500
549	.8625	3669	.8625
550	.8750	3670	.8750

BLOCK E

Chann.	MOBILE Freq.	BASE Chann.	STATION Freq.
561	897.0125	3681	936.0125
562	.0250	3682	.0250
563	.0375	3683	.0375
564	.0500	3684	.0500
565	.0625	3685	.0625
566	.0750	3686	.0750
567	.0875	3687	.0875
568	.1000	3688	.1000
569	.1125	3689	.1125
570	.1250	3690	.1250

BLOCK F

Chann.	MOBILE Freq.	BASE Chann.	STATION Freq.
581	897.2625	3701	936.2625
582	.2750	3702	.2750
583	.2875	3703	.2875
584	.3000	3704	.3000
585	.3125	3705	.3125
586	.3250	3706	.3250
587	.3375	3707	.3375
588	.3500	3708	.3500
589	.3625	3709	.3625
590	.3750	3710	.3750

BLOCK G

Chann.	MOBILE Freq.	BASE Chann.	STATION Freq.
601	897.5125	3721	936.5125
602	.5250	3722	.5250
603	.5375	3723	.5375
604	.5500	3724	.5500
605	.5625	3725	.5625
606	.5750	3726	.5750
607	.5875	3727	.5875
608	.6000	3728	.6000
609	.6125	3729	.6125
610	.6250	3730	.6250

BLOCK H

Chann.	MOBILE Freq.	BASE Chann.	STATION Freq.
621	897.7625	3741	936.7625
622	.7750	3742	.7750
623	.7875	3743	.7875
624	.8000	3744	.8000
625	.8125	3745	.8125
626	.8250	3746	.8250
627	.8375	3747	.8375
628	.8500	3748	.8500
629	.8625	3749	.8625
630	.8750	3750	.8750

BLOCK I

Chann.	MOBILE Freq.	BASE Chann.	STATION Freq.
641	898.0125	3761	937.0125
642	.0250	3762	.0250
643	.0375	3763	.0375
644	.0500	3764	.0500
645	.0625	3765	.0625
646	.0750	3766	.0750
647	.0875	3767	.0875
648	.1000	3768	.1000
649	.1125	3769	.1125
650	.1250	3770	.1250

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Figure P-1
Channel Numbering Plan

Block J

BLOCK	MOBILE Chan.	Freq. 898.2625	BASE STATION Chan.	Freq. 937.2625
J	661	898.2625	3781	937.2625
	662	.2750	3782	.2750
	663	.2875	3783	.2875
	664	.3000	3784	.3000
	665	.3125	3785	.3125
	666	.3250	3786	.3250
	667	.3375	3787	.3375
	668	.3500	3788	.3500
	669	.3625	3789	.3625
	670	.3750	3790	.3750

Block K

BLOCK	MOBILE Chan.	Freq. 898.5125	BASE STATION Chan.	Freq. 937.5125
K	681	898.5125	3801	937.5125
	682	.5250	3802	.5250
	683	.5375	3803	.5375
	684	.5500	3804	.5500
	685	.5625	3805	.5625
	686	.5750	3806	.5750
	687	.5875	3807	.5875
	688	.6000	3808	.6000
	689	.6125	3809	.6125
	690	.6250	3810	.6250

Block L

BLOCK	MOBILE Chan.	Freq. 898.7625	BASE STATION Chan.	Freq. 937.7625
L	701	898.7625	3021	937.7625
	702	.7750	3022	.7750
	703	.7875	3023	.7875
	704	.8000	3024	.8000
	705	.8125	3025	.8125
	706	.8250	3026	.8250
	707	.8375	3027	.8375
	708	.8500	3028	.8500
	709	.8625	3029	.8625
	710	.8750	3030	.8750

Block N

BLOCK	MOBILE Chan.	Freq. 899.0125	BASE STATION Chan.	Freq. 938.0125
N	721	899.0125	3841	938.0125
	722	.0250	3842	.0250
	723	.0375	3843	.0375
	724	.0500	3844	.0500
	725	.0625	3845	.0625
	726	.0750	3846	.0750
	727	.0875	3847	.0875
	728	.1000	3848	.1000
	729	.1125	3849	.1125
	730	.1250	3850	.1250

Block N (899.2625)

BLOCK	MOBILE Chan.	Freq. 899.2625	BASE STATION Chan.	Freq. 938.2625
N	741	899.2625	3861	938.2625
	742	.2750	3862	.2750
	743	.2875	3863	.2875
	744	.3000	3864	.3000
	745	.3125	3865	.3125
	746	.3250	3866	.3250
	747	.3375	3867	.3375
	748	.3500	3868	.3500
	749	.3625	3869	.3625
	750	.3750	3870	.3750

Block O

BLOCK	MOBILE Chan.	Freq. 899.5125	BASE STATION Chan.	Freq. 938.5125
O	761	899.5125	3881	938.5125
	762	.5250	3002	.5250
	763	.5375	3003	.5375
	764	.5500	3004	.5500
	765	.5625	3005	.5625
	766	.5750	3006	.5750
	767	.5875	3007	.5875
	768	.6000	3008	.6000
	769	.6125	3009	.6125
	770	.6250	3090	.6250

Block P

BLOCK	MOBILE Chan.	Freq. 900.7625	BASE STATION Chan.	Freq. 938.7625
P	701	900.7625	3901	938.7625
	702	.7750	3902	.7750
	703	.7875	3903	.7875
	704	.8000	3904	.8000
	705	.8125	3905	.8125
	706	.8250	3906	.8250
	707	.8375	3907	.8375
	708	.8500	3908	.8500
	709	.8625	3909	.8625
	790	.8750	3910	.8750

Block Q

BLOCK	MOBILE Chan.	Freq. 900.0125	BASE STATION Chan.	Freq. 939.0125
Q	801	900.0125	3921	939.0125
	802	.0250	3922	.0250
	803	.0375	3923	.0375
	804	.0500	3924	.0500
	805	.0625	3925	.0625
	806	.0750	3926	.0750
	807	.0875	3927	.0875
	808	.1000	3928	.1000
	809	.1125	3929	.1125
	810	.1250	3930	.1250

Block R

BLOCK	MOBILE Chan.	Freq. 900.2625	BASE STATION Chan.	Freq. 939.2625
R	821	900.2625	3941	939.2625
	822	.2750	3942	.2750
	823	.2875	3943	.2875
	824	.3000	3944	.3000
	825	.3125	3945	.3125
	826	.3250	3946	.3250
	827	.3375	3947	.3375
	828	.3500	3948	.3500
	829	.3625	3949	.3625
	830	.3750	3950	.3750

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Figure F-1
Channel Numbering Plan

BLOCK	MOBILE Chan.	Freq.	BASE STATION Chan.	Freq.	BLOCK	MOBILE Chan.	Freq.	BASE STATION Chan.	Freq.
S	841	900.5125	3961	939.5125	T	861	900.7625	3981	939.7625
	842	.5250	3962	.5250		862	.7750	3982	.7750
	843	.5375	3963	.5375		863	.7875	3983	.7875
	844	.5500	3964	.5500		864	.8000	3984	.8000
	845	.5625	3965	.5625		865	.8125	3985	.8125
	846	.5750	3966	.5750		866	.8250	3986	.8250
	847	.5875	3967	.5875		867	.8375	3987	.8375
	848	.6000	3968	.6000		868	.8500	3988	.8500
	849	.6125	3969	.6125		869	.8625	3989	.8625
	850	.6250	3970	.6250		870	.8750	3990	.8750

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4.5.2. OUTPUT POWER - MOBILE UNITS

The units must be capable of operating at various power levels as designated by the system in the TXPOW parameter in the <SVP> frame from the network. The required levels are:

OUTPUT POWER	dB BELOW FULL POWER
10 W	0 (Maximum power)
4 W	4
1.6 W	8
0.63 W	12
0.25 W	16
0.10 W	20

The tolerance on output power levels shall be $\pm$ 2.0 dB.

4.5.3. POWER CONTROL - MOBILE UNITS

In addition to exercising output power control as mandated by the network in the TXPOW parameter, mobile units must automatically reduce power level maximum output based on the average received signal strength indication (RSSI) from the current base (as measured during the normal system channel monitoring procedure associated with roaming). This is done to prevent front-end overload of base station receivers from mobile units operating in close promimity.

Mobile output power must be automatically reduced, if necessary, based on RSSI values from the current base station system channel, according to the following table:

Average RSSI Range	Maximum Operating Power Allowed	
	Watts	dB below 10 W
RSSI $\leq$ 24	10	0
24< RSSI $\leq$ 28	4	4
28< RSSI $\leq$ 32	1.6	8
32< RSSI $\leq$ 36	0.63	12
36< RSSI $\leq$ 40	0.25	16
40< RSSI	0.10	20

Values given in the first column of the table must be stored in alterable non-volatile memory to allow for possible future adjustments.

With regard to automatic power reduction in mobile units, the maximum power output specified by the network on the TXPOW parameter sets an upper limit, but not a lower limit, on the actual output power to be used by the mobile unit.

The maximum effective radiated power (ERP) for a mobile must be limited to 10 watts.

4.5.4 CARRIER ON STATE

The controller shall key the carrier "on" (i.e. shall apply power to carrier) only when it is ready to transmit a message. The transmitter is ready under two different conditions.

a) after switching from receiving to transmit condition, during which the switching time should be less than 20 ms (including CPU handling time)

b) When switching from one channel frequency to another, during which the switching time should not exceed 30 ms.

4.5.5 PROTECTION AGAINST FALSE TRANSMISSION

A protection circuit shall be provided to minimize the likelihood that transmitter operation could occur falsely due to a component failure. The protection circuit shall consist of an RF output power detector and a transmitter enable which is entirely independent of the main transmitter on--off control circuit. The RF power detector and a transmitter enable which is entirely independent of the main transmitter on-off control circuit. The RF power detector shall be examined from time to time by the control logic and the radio should be shut down if RF power is detected when the radio is not keyed on.

4.5.6 MOBITEX ACCESS NUMBER (MAN)

The mobile access number will be included in the customer specific PROM, as documented elsewhere in this specification. It will be a 24 bit number that will be specific to the terminal, and will be programmed on at service initiation.

4.5.7 STANDARD ELECTRO-MECHANICAL INTERFACES

It is recommended that radio/modem equipment be designed with standard interfaces to facilitate customer connection of different terminals. If a manufacturer provides a totally integrated unit, this requirement does not apply.

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The modem shall interconnect with the terminal via an RS-232 interface. If the application includes accessory peripherals (such as a printer), such connections shall also be by use of an RS-232 interface.

4.6 TERMINAL TIMEOUTS AND PARAMETER STORAGE REQUIREMENTS

The following timeout values will be in effect for terminal units operating within the Cantel Mobitex network:

4.6.1 POWER-ON DELAY

Delay after power-on or return from "manual mode":
45 (+/-) 15 seconds.

4.6.2 QUICK SCAN DELAY

Delay after lost contact with base, before the "quickscan" procedure is activated: 30 seconds.

4.6.3 CONGEST TIME OUT

Timeout on CONGEST state retransmit:
120 seconds.

4.6.4 MAXIMUM REPETIONS

Maximum number of transmit repetitions (default value of MAX_REP); 5
·Note that the current value of MAX-REP is given by the network in the <SVP> frame.

4.6.5 PARAMETER STORAGE REQUIREMENTS FOR MOBILE UNITS

4.6.5 PERMANENTLY STORED/UNALTERABLE

- ESN
- TTY = 3

FBI = 4
- Channel class = 4
- Working method = 2
- Radio Output power = 10
- Radio Tx/Rx Switch Time = ($\leq$ 20)

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4.6.5.2 PERMANENTLY · STORED/ELECTRONICALLY ALTERABLE BY AUTHORIZED PERSONNEL

- MAN
- Priority
- Frame Synch Pattern(s)
- Default List
- Roam Scanning Cycle Length = 10
- Congest Time Out = 120
- Quick Scan Initial Delay = 30 sec.
- Power on Delay = 45 sec.
- RSSI Levels for Power Control (=24, 28, 32, 36, 40)

4.6.5.3 DYNAMICALLY ALTERABLE BY MOBILE

- Group List
- Temporary Default List
- Current List
- Die/Live State
- MAX-REP
- Selected Frame Sync. Pattern
- Personal Subscription List
- Current Base Area ID
- Current System Channel
- Packet Sequence Number
- Frame Sequence Number
- Area ID's allowed
- Present Text

4.7   SCANNING PROCEDURES

4.7.1   LISTS OF CHANNELS

The mobile unit uses various lists of radio channels to search for new base radio stations during the roaming procedure. Refer to Chapter 2, Appendix A, for an overview of the roaming procedure.

In order to facilitate the roaming procedure, the unit should have the ability to minimize the total number of radio channels that have to be searched. The following lists of channels are available in the mobile unit for scanning.

CURRENT-BASE is the base radio station with which the mobile unit is communicating at present, or the one with which it was last in contact.

CURRENT-LIST is received by the mobile unit in the <SVP> frame and contains the system channels used by the neighbouring base radio stations.

DEFAULT-LIST is a list of all system channels used in the network.

TEMPORARY DEFAULT-LIST is an alternative. short list of system channels in the mobile unit's usual (or authorized) operating area.

The choice of which of the two default lists normally used in the mobile unit will be dependent on both the extent of the operating are and the particular application. However, the complete DEFAULT-LIST defined by the network operator should be permanently stored in the mobile terminal, even though it may be seldom used.

4.7.2 ALTERNATIVE PROCEDURES AND MODES

In order to minimize the time during which mobile units are out of contact with a base station, the scanning procedure to be used will vary depending on particular circumstances. Specifically:

1. Base Stations in the area in which the mobile unit is operating may share an area system channel, or each of them may have its own separate system channel.

2. The mobile unit may have contact with a base station, and therefore be using the normal scanning procedure; or it may have lost contact for some time, and therefore be using the quick scanning procedure.

3. For roaming purposes, the system may be operating in FRAME Mode (in which case RSSI measurements are made using frame heads), or in CONTINUOUS MODE (in which case RSSI measurements are initially made on base station carriers that are maintained continuously on).

Details of the normal and quick scanning procedures, and of the FRAME and CONTINUOUS modes of operation are summarized in Appendix A of Chapter 2.

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With respect to case 1 above, the mobile unit must be designed to accommodate scanning of alternative base stations (normal scanning procedure), or searching for new base stations (quick scanning procedure) on the current (or last used) system channel frequency before scanning other channels. It is recommended that this be the first priority scanning operation in the mobile unit.

Next, for either normal or quick scanning procedure, the mobile unit searches the current (neighbour) list of system channels provided by the network in the <SVP> frame. In the case of normal scanning, this search in conducted during the SCAN-Time interval designated in the <SVP> frame.

Finally, for the quick scanning procedure (In case the mobile unit has not yet contacted a base station), either the normal or the temporary default list of system channels is scanned, depending on which has been designated for the mobile unit. During the quick scanning procedure, the unit must return to scan the last used system channel after every ten scans of other channels.

The mode of operation in effect, FRAME or CONTINUOUS, does not alter the scanning sequence. CONTINUOUS mode cannot be used when base stations share an area system channel, but its use where possible will shorten the time required for a mobile unit to re-establish contact with the network after contact has been lost.

While scanning under CONTINUOUS MODE, the mobile must, after finding a carrier with a satisfactory RSSI, acquire and evaluate one or more frame heads to determine whether or not it has found a valid base station. If it has not, scanning continues.

4.7.3. PARAMETERS

The maximum number of channels to be stored in the current (neighbour) list of system channels in the mobile unit is 32.

The maximum number of channels to be stored in the permanent default list of system channels in the mobile unit is 256.

The maximum number of system channels to be stored in the alternative, temporary default list of system channels in the mobile unit is 64.

Which of the two default lists is to be used by the mobile unit during the quick scanning procedure must be selectable from the application layer.

Further Information: R1-02 (appendix A), R1-08, R1-16, R1-18

4.8. GENERAL DESIGN REQUIREMENTS

4.8.1 COMMON REQUIREMENTS FOR ALL FIXED, MOBILE, AND PORTABLE TERMINALS.

Dimensions:
The manufacturer shall select dimensions of his product.

Weight:
The manufacturer shall select the weight objectives for his product.

Radiation:
Electromagnetic Interference (EMI) radiated from any terminal design must be within the limits specified by the Appropriate DOC regulations.

Storage:
When packaged, all terminals shall be capable of being stored in temperatures of -40 C. to + 65 C. and in humidities up to 90% for temperatures up to 30 C with constant air moisture content at temperatures between +30 C and + 65 C.

4.8.2 ADDITIONAL REQUIREMENT FOR MOBILE TERMINALS.

Radiation Limitations:

Harmonic and Spurious Radiation, Carrier On:
The mean power of harmonic and spurious emissions from the transmitter, as measured at the antenna connector with the transmitter properly terminated, shall be at least 25 microwatts. These emissions shall be measured as defined by Department of Communications publication RSS122 paragraph 7.3.

Radiation with Carrier Off:

With the transmitter keyed off, any emissions from the transceiver, as measured at the antenna connector with proper terminations, shall not exceed 60 dBm in the mobile transmit band, 896-901 MHz or -80 dBm in the mobile receive band 935 to 940 MHz.

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Radiation susceptibility:

The transceiver design and the specification for the associated RF cable connecting to the antenna shall provide sufficient shielding to permit normal operation of the mobile while the internal combustion engine of the car or truck in which it is installed is operating at highway speeds.

4.9 ENVIRONMENTAL REQUIREMENTS

Mobitex terminals must meet the following basic requirements. Section 4.9.1 below describes requirements for mobile units, designed for use in land vehicles and watercraft. Section 4.9 provides the requirements for fixed terminals.

4.9.1 BASIC ENVIRONMENTAL REQUIREMENTS FOR VEHICULAR INSTALLED UNITS

Temperature:
The mobile unit must be capable of operation in the temperature range of -25 C (13F) to + 55 C (131 F). The manufacturer may wish to meet additional extended temperature limits for applications in hot desert or in extreme winter environments. If so, he may specify the extended temperature limits his units are capable of meeting.

Relative humidity:
The terminal must be capable of operation at relative humidities between 5% and 100% of temperatures below 30 C (86 F) and between 5% and 90% at temperatures between 30 C. and 55 C.

NOTE:

Since relative humidity in a test chamber cannot be controlled with high accuracy, testing will be performed at humidities of 5% and 90%. While no attempt will be made to set the humidity above 90%, the manufacturer should recognize that at times during temperature cycling water in humid air will condense on the terminal and, unless hermetically sealed, on the circuit boards within the terminal. The terminal must be capable of operation with water from humid air condensed on it and in it.

4.10 MASC INTERFACE ERROR MESSAGES
(to be supplied later)

5.   DOCUMENTATION AND REVISION CONTROL

Each manufacturer shall maintain documentation of his terminal products and subassemblies. He must maintain records of revisions and waivers, if any, applicable to the equipment he produces, together with a record of the model designation, serial numbers, or production codes affected by any such revision or waiver. Where subassemblies or modules are procured from other vendors the manufacturer may either keep his own records applicable to the procured subassembly of module or require his vendor to do so.

6.   QUESTIONS AND ANSWERS

From time to time, manufacturers will question Cantel concerning specification matters. All such questions will be answered by Cantel and the question and answer distributed to all registered holders of this specification. Such questions and answers should be filed in this section of the specification. They will be numbered so that directions to destroy certain questions and answers can be sent with updates to other section of the specification.

6.1   Question:

How does one know the length of an MPAK? That is, the MPAK doesn't have any field stating the length?

Answer:

Mobitex radio protocol.
Here the frame length is stated in the primary block. In this block one field states the number of blocks following the primary block.

Line protocol
As an example we use HDLC (and LAPB).

In these protocols, the start and the end of a frame is indicated by special flags (predefined bit combinations). If a receiver wants to know the length of a received frame, this is done by counting the number of bytes between the start and end flags.

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APPENDIX A

Frequency Utilization for Mobitex

The minimum C/I requirement for the Cantel Mobitex network is 15 dB for a 1.2 kbit/s data channel and 18 dB for an 8 kbit/s channel. Compared to the C/I requirement of 17 to 18 dB for a voice channel which is generally applied to an 800 MHz cellular system, it is possible that the frequency reuse pattern for the Mobitex network can be derived with reference to that of a cellular network.

Most cellular systems have employed the standard AMPS channelling plan which permits the same group of radio frequencies to be reused in a specific pattern. With the typical 7-site reuse patter (N = 7), it is generally possible to achieve a C/I protection ratio of 18 dB in an urban environment.

If we apply the N = 7 frequency reuse plan to the Mobitex system, it is apparent that there will be some excessive system margin during the initial implementation of our system operating at 1.2 kbit/s. However, since our 1.2 kbit/s system will shortly be augmented by the 8 kbit/s system which requires more stringent C/I requirement, frequency planning for the Mobitex network should consider the worse case (i.e., 8 kbit/s system).

Since the C/I requirement for the Mobitex 8 kbit/s system is almost the same as that of a cellular system, Mobitex can virtually be regarded as a cellular system for frequency planning and coverage planning purposes. Taking account of the need to minimize the use of the radio spectrum and yet ensure adequate C/I protection to guard against co-channel interference, an N = 7 frequency reuse pattern is recommended.

The N = 7 frequency reuse pattern to be used for the Mobitex network is slightly different from that commonly seen in a cellular system, i.e. a 7/21 plan (7 cells/21 sectors). In the 7/21 plan, a minimum of three channels are required to be arranged in sectors within a cell.

For the Mobitex network, omnidirectional antennas will be used at most of the base station sites and sectorized arrangements will be avoided as far as possible. This will help to minimize the requirement for spectrum allocation. There will be the cases where special engineering efforts (e.g., proper siting and positioning of the base station antenna) will be needed to meet the C/I requirement.

Based on an N = 7 frequency reuse pattern, the following frequency assignment plan for 12.5 KHz channelization of the 900 MHz trunking band is proposed:

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Exhibit 2, p. 124

Cantel Mobitex™

GROUP	BASE TX FREQUENCY
1	$F1 + 0.25N$
2	$F1 + 0.25N + 0.025$
3	$F1 + 0.25N + 0.050$
4	$F1 + 0.25N + 0.075$
5	$F1 + 0.25N + 0.100$
6	$F1 + 0.25N + 0.125$
7	$F1 + 0.25N + 0.150$

Where F1 is the base Tx frequency (within the frequency range 935 MHz to 940 MHz) for the common system channel and $N = 1, 2, 3$, etc.

The corresponding base Rx frequency is 39 MHz below the Base Tx frequency [i.e., Base Rx frequency - Base Tx frequency - 39 (MHz)].

This frequency plan is based on an equi-spaced channelling arrangement with a minimum Tx/Tx separation of 250 KHz. It is necessary to maintain a minimum Tx/Tx separation of 250 KHz for satisfactory performance of the transmitter combiner. We consider this type of plan desirable to limit any possible intermodulation products to within the Mobitex system itself instead of causing potential problems to other radio systems, while at the same time reducing combining losses.

Cantel has been assigned a national system channel; BASE Tx: 939.9875, Base Rx: 900.9875, and the following local channels:
[939.9875,900.9875], [939.7500,900.7500], [939.7375,900.7375],
[939.7250,900.7250], [939.5000,900.5000], [939.4875,900.4875],
[939.4750,900.4750], [939.2500,900.2500], [939.2375,900.2375],
[939.2250,900.2250], [939.2125,900.2125], [939.0000,900.0000],
[938.9875,899.9875], [938.9750,899.9750], [938.9625,899.9625],

The frequency band 896-901/935-940 MHz (901-902/940-941 MHz is frozen) has 400 channels (12.5 KHz channel width) available, in 10 blocks with block sharing between Canada and USA, and 40 channels per block. (Only the Base Rx band is shown)

BLOCK	40 CHANNEL BLOCK
1	896.0 to 896.5
2	896.5 to 897.0
3	897.0 to 897.5
4	897.5 to 898.0
5	898.0 to 898.5
6	898.5 to 899.0
7	899.0 to 899.5
8	899.5 to 900.0
9	900.0 to 900.5
10	900.5 to 901.0

MTS A.2   Date: 25-Jul-90

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Uppgjord Prepared	Faktansvarig Subject responsible	Nr No
ET/SYSC STT	ET/SYSC STT	2/1056 - A 296 5171/02 Ue

Dokansv Godkänd Doc respons/approved		Datum Date	Rev	Fil File
ET/SYSC STT STT		1990-02-20	G	MTS08.2

Sekretess	Title
Cantel Mobitex	MOBITEX Application layer for terminals

ABSTRACT

This document specifies the application layer for terminals to be connected to the MOBITEX network.

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1 INTRODUCTION

1.1 GENERAL

The application layer is the network's face to the users. This is where the user and the terminal designer have almost unlimited possibilities to adapt the terminals and use the network for many different applications.

In this specification, all layers above the network layer are considered as the application layer.

The application layer has been specified as little as possible. The minimum which has been decided upon is necessary for users to be able to quickly recognize and use common functions in the different types of terminals.

Most of the functions stated on the application level are only recommendations and can be used as required by the terminal manufacturer.

Of course, the terminals should be easy to handle and should permit the communication which the user of the equipment may require.

For the lowest of the application layers, the Transport Layer, separate recommendations are being considered. Among other things, these recommendations will deal with the handling of messages longer than 512 octettes (sequence numbering between terminals of sub-messages and the rearranging of received sub-messages into correct order before delivery to upper layers).

2 FUNCTIONS IN THE APPLICATION LAYER

The application layer is the user interface. The only functions where requirements and recommendations are specified are:

- addressing of messages,

- choice of status message,

- emergency traffic,

- personal subscription interface,

- presentation of network messages,

- manual radio mode,

- manual activation of mobile terminals,

- flow control,

- network identification number,

- area identification number and

- radio channel lists.

For other areas we recommend that terminal designers develop functions according to user requirements.

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2.1 ADDRESSING OF MESSAGES

A message contains the information which the user wishes to transfer, supplemented with information which is necessary for the message to reach the correct subscriber. in the network.

There is a number of different methods of addressing a MOBITEX message between user and terminal. These methods can be divided up and designated in the following manner:

* Number dialling:
  - MOBITEX subscription number (MAN)
  - abbreviated number
  - default number
  - number sequence
  - alternative dialling

* Other addressing methods:
  - special keys
  - letter combinations (e.g names)
  - direct addressing with MAN from connected application equipment.

Each terminal which is connected to MOBITEX shall permit one or more of the methods above. The terminals which permit number dialling in any form shall also permit manual dialling with complete MOBITEX subscription numbers (MAN).

When presenting senders for messages received, MAN shall always be shown to the user. Either separate or parallel with one of the above address types.

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2.1.1   GENERAL INFORMATION ABOUT NUMBER DIALLING

All number dialling is recommended to comply with the
following principle:

NO + FUNCTION + TERMINATOR

NO is a number of one of the following types:

- MAN   1-8 digits

- abbreviated number   a few digits, ended by numbering
                          character #.

- number sequence   several optional numbers,
                          separated by a comma',',
                          asterisk '*' or semicolon ';'

- default number   no number given -
                          FUNCTION/TERMINATOR given
                          directly.

FUNCTION and TERMINATOR comprises of one or more
predetermined key strokes. FUNCTION terminates the NO
input and selects the function to be used (e.g. status
message, text message or speech call). Additional
information (e.g. status number or text message) is
entered after FUNCTION and is terminated by TERMINATOR.
TERMINATOR normally initiates the transmission (e.g. SEND
button). For predetermined messages, FUNCTION and
TERMINATOR can be combined in the same key.

2.1.2   NUMBER DIALLING/PRESENTATION WITH MAN

If a terminal allows any form of number dialling, the
terminal shall also permit number dialling with MAN.

MAN shall be stated and presented in decimal form.

The sender's MAN shall be presented for each message to
the user. This can be separately or in parallel with
another address type.

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2.1.3 NUMBER DIALLING WITH ABBREVIATED NUMBERS

Recommendation:

Terminals with number dialling can offer the user the option of using abbreviated numbers. Abbreviated numbers are defined locally in each terminal.

An abbreviated number is distinguished by the terminating character '#'.

An abbreviated number is usually one or two digits.

Abbreviated numbers are not supposed to start with one or more zeros.

2.1.4 NUMBER DIALLING WITH DEFAULT NUMBERS

Recommendation:

A terminal can offer the user a very quick and simple addressing method - default numbers.

When using default numbers, the terminal is designed so that it interprets the lack of address (NO) in the message as a certain predetermined address.

The predetermined numbers can be either one default number per FUNCTION or a general default number for all FUNCTIONS.

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2.1.5 NUMBER DIALLING WITH NUMBER SEQUENCE

Recommendation:

Terminals which are connected to MOBITEX can permit addressing with number sequence. This means that the users can address one and the same message to several independent addressees.

When a number sequence is used, the terminal sends a message with an address list (refer to reference R1-09).

Note that the use of a number sequence when requesting a speech connection (connection request) is not permitted.

All types of numbers which the terminal allows for separate number dialling shall also be permitted for number sequence. Conversion to MAN shall take place in the normal way.

If another addressing principle is permitted, e.g. name, we recommend that these addresses are also permitted in the number sequence.

Addresses in the number sequence shall be separated by a comma ',', asterisk '*' or a semicolon ';'.

The number sequence is terminated by FUNCTION.

Note that two separation characters in sequence shall be interpreted as the default number for the relevant FUNCTION - if default numbers are available.

2.1.6 NUMBER DIALLING WITH OTHER NUMBERS

Types of numbers other than those stated above may be used. Different types of internal company numbers belong to this category.

These numbers must also follow the number dialling procedure (NO + FUNCTION) and shall be converted to MAN in the application layer.

2.1.7 OTHER ADDRESSING PRINCIPLES

A number of methods for addressing messages between user and terminal may be used in addition to those stated above.

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2.1.8 SPECIAL KEYS

Recommendation:

Terminals can be fitted with special keys each of which represent a MAN, or with keys which generate predetermined messages addressed with MAN, etc.

2.1.9 LETTER COMBINATIONS

Recommendation:
The user can store MAN for a number of different users in the terminal and then select MAN for a message by writing the receiver's name with letters.

2.1.10 DIRECT ADDRESSING FROM CONNECTED APPLICATION EQUIPMENT

Recommendation:
The addressing of messages can take place automatically in the application equipment if such equipment is connected to the terminal.

We recommend that such addressing be carried out with MAN according to the format which is specified in relation to lower layers. If MAN is used, no further conversion is necessary.

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2.2   STATUS MESSAGES

Messages which are often repeated such as "I'M AVAILABLE",
"I'M ENGAGED", "I'M OFF TO LUNCH" etc. can be coded as
status codes. Such status codes constitute information in
status messages.

The advantage of a status message is that it is
transmitted much quicker than the corresponding text
messages.

The MOBITEX network can transmit 256 different status
codes in such status messages. Which status codes are to
be used, and what they mean, are defined in each terminal.

The status message type of traffic is recommended for all
types of terminal which are connected to MOBITEX.

2.2.1   CHOICE OF STATUS CODE

The method of selecting a status code can vary somewhat
between different terminals. We recommend that one or more
of the following methods be used from a terminal:

A)   Direct dialling with special status keys, which
      generate addressed status messages with
      predetermined status code (normal address and status
      code generated by status key).

B)   Dialling with special status keys which generate
      predetermined status messages without addresses.
      Addressing is carried out according to the normal
      addressing method (NO + FUNCTION + TERMINATOR where
      FUNCTION + TERMINATOR are combined in the relevant
      status key).

C)   Dialling with decimal (or possibly hexadecimal)
      status code and normal addressing.

Initial zeros need not be entered before a decimal status
code.

The user's procedure when sending status messages shall be
as near as possible to that used for other types of
messages.

Alternative A means a significant simplification of the
procedure.

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It is recommended that the terminal is able to present both the <u>translated status code</u> and the <u>decimal status code</u> (simultaneously or alternatively). This makes it possible to use one and the same terminal within different terminal groups with different definitions of status codes.

For terminals which are used within several such groups, we recommend that a further simplification of the procedure be made by the terminal converting the status code in accordance with different code keys depending on which sender the message has.

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2.3 EMERGENCY TRAFFIC

Emergency traffic normally means the following in terms of the user:

- sending emergency signals from mobile terminals (mobile terminal subscription or personal subscription logged-in to mobile terminal),

- receiving emergency messages in a fixed terminal,

- sending an emergency acknowledgement from a fixed terminal and

- setting up an emergency line connection between the receiving fixed terminal and the alarming mobile terminal.

However, the network operator decides how the emergency service should be launched, i.e. which subscription types to generate and receive emergency messages. It could also be possible to manage this on an individual subscriber basis.

2.3.1 EMERGENCY SIGNAL

An emergency signal which is normally sent from a vehicle contains dynamic information. The form of this dynamic information component is defined in the network layer.

The dynamic information contains current data about the user. This data may have been stored for a longer period in the mobile terminal, it may have been accessed from peripheral equipment and/or may have been entered at the terminal short time before sending the emergency signal.

The dynamic information may contain a maximum of 256 alphanumeric characters from the 'MOBITEX text code' (see reference R1-06 for definition). The source of the emergency signal may also be indicated (see reference R1-19 for definition).

Each line of the dynamic information may normally contain a maximum of 80 characters. There must not be more than 10 lines of dynamic information.

The lines are separated from each other with a carriage return (CR) followed by a line feed character (LF).

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2.3.2 EMERGENCY MESSAGES

An emergency message which reaches an emergency receiver contains the dynamic information (i.e. the emergency signal) as well as the static information component which is stored in the network together with information about the addressee of the emergency message.

The static information contains general data about the sender, the terminal etc. which may be of interest in an emergency. The contents shall be compiled through collaboration between the sender and the addressee of the emergency message.

The storage of static information for emergency messages is handled in MOBITEX by network operators in accordance with the subscriber's wishes. The users are responsible for their emergency information being correct and current.

The static component of the emergency information may normally contain a maximum of 256 characters from the 'MOBITEX text code' (see reference R1-06 for definition).

The emergency message should not consist of more than 512 characters. Each line in both the static and dynamic information components may contain a maximum of 80 characters. There must not be more than 20 lines in both these components together.

The lines are separated from each other by a carriage return (CR) followed by a line feed character (LF).

The fixed terminals receiving the emergency message shall be able to print out the message in plain text, according to 'MOBITEX text code' (see reference R1-06 for definition).

When an emergency message is received at a terminal, the user is to be informed of this immediately. It is then optional whether the emergency message is to be presented directly in its entirety or whether the sender is to request the message manually.

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2.3.3 EMERGENCY ACKNOWLEDGEMENT

The emergency acknowledgement is sent from the receiving terminal to the sender of the emergency signal.

The emergency acknowledgement is generated after having been initiated manually.

The MOBITEX network does not carry out any monitoring or control that the emergency message is followed by an emergency acknowledgement.

The procedure for generating an emergency acknowledgement shall comprise a function selection followed by a suitable terminator.

FUNCTION SELECTION + TERMINATOR

Note that this procedure shall always be carried out manually for security reasons.

The emergency acknowledgement can be presented in a suitable manner in the alarming terminal.

2.3.4 EMERGENCY CONNECTION

A line connection for speech can be set up between the emergency receiving terminal and the alarming terminal (an emergency connection).

Any automatic generation of an emergency connection in conjunction with an emergency acknowledgement can be solved in the respective application. The network interprets the emergency acknowledgement and the emergency connection as two separate procedures.

2.3.5 EMERGENCY DISCONNECTION

A mobile terminal involved in a one way emergency connection with the transmitter on, i.e. silent emergency connection, shall turn the transmitter off for five seconds each minute to be available for disconnection or other packets and to prevent the transceiver from being turned off after 10 minutes. The 10 minutes refers to the control circuit, which prohibits the continuous transmission of carrier for longer periods than 10 minutes, see reference R1-18.

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2.4   PERSONAL SUBSCRIPTION INTERFACE

2.4.1   PASSWORD

When a personal subscription is requested to be logged-in, a password must be entered, for the network to accept the subscriber. The password also shows that the operator is authorized to use the personal subscription.

Since the password constitutes the key to the personal subscription, it is in the user's interest to keep his password secret.

A password can consists of up to 8 alphanumeric characters. The permitted characters in the network are: the upper case letters A-Z and numbers 0-9. It is recommended that terminals convert lower case letters (a-z) in passwords to upper case.

The form of the password between terminal and network is described in the network layer.

(In addition to this type of password the terminal can of course have local passwords which are never sent to the network).

2.4.2   LOGGING IN PERSONAL SUBSCRIPTIONS

A personal subscription can be used in traffic after the order for log-in is approved. After cancelling the log-in, the subscription is deactivated.

2.4.3   LOG-IN PROCEDURE

The procedure for logging in a personal subscription in respect of the user follows the procedure below:

FUNCTION SELECTION + MAN + TERMINATOR + PASSWORD + TERMINATOR

'MAN' in this context is the personal subscriber's MAN.

It is recommended that the password cannot be read from the terminal to safeguard the user's interest. Asterisks or similar can be printed out instead.

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2.4.4   LOG-OUT PROCEDURE

The procedure of logging out a personal subscription is
similar to the log-in procedure, except that the password
is left out.

FUNCTION SELECTION + MAN + TERMINATOR

'MAN' in this context is the personal subscription's MAN.

2.4.5   NETWORK ORDER TO LOG OUT A PERSONAL SUBSCRIPTION

When a terminal logs out a personal subscription, ordered
by the network, the user should be informed about this.

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2.5   PRESENTATION OF NETWORK MESSAGES

Messages, except user traffic sent from the network, can be network orders or information. It can also be a message earlier sent by the user and for any reason returned by the network.

In reference R1-06 national requirements, such as language and identification number, made on the presentation is defined.

These messages should be presented with the information given in the traffic state, described in reference R1-09.

Please note the presentation when receiving messages or signals described below.

Note: Incoming packets with traffic state CONGEST are allowed to be retransmitted, but not within a given timeout (reference R1-06).

2.5.1   NETWORK INFORMATION AND ORDER MESSAGES

DTESERV:LIVE/DIE.

>   If a DIE is received, or the user tries to send user traffic when a DIE is received, this should be shown to the user.
>   It should also be shown to the user when the terminal has received a LIVE, and can resume sending of user traffic.

Signal:SPEECH_QUEUE_INFO.

>   This is a signal created by the link layer. The meaning of the signal is that no speech channel is immediately available, and the speech connection request is placed in a queue. The signal contains the speech queue number for the request. Both that the request is queued and the queue number, should be presented to the user.

Signal BASE_LOST.

>   This is a signal created by the link layer. The meaning of the signal is to show to the user that contact with the base radio station is lost and no messages can be transmitted.

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Signal BASE_CONTACT.
> This is a signal created by the link
> layer. The meaning of the signal is to
> show to the user that contact with the
> base radio station is established again.

2.5.2   RETURNED MESSAGES AS "NOT TRANSMITTED"

A message indicated as a "not transmitted " message, i.e.
there is no acknowledgement of the message from the
network, should be presented as described below and
required in reference R1-09.

General: The message is presented as a "not
              transmitted" message. The meaning of "not
              transmitted" shall be apparent during the
              presentation.

PSUBCOM: As "General".

PSOSCOM: As "General".
              The application decides if the message
              shall be presented or not, e.g. send the
              message to the link layer again.

CSUBCOM: As "General".
              The disconnection is presented as a
              reaction of the "not transmitted" message.
              A line connection request can have the
              indication "not transmitted" when the
              lower layer has received a "NAT-frame".

DTESERV:LOGINREQ/LOGOUT:
              As "General".
              The personal subscription is to be
              considered as logged-out by the terminal.

DTESERV:SOSRX/VICESOSRX.
              As "General".

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2.6   MANUAL RADIO MODE

Mobile terminals may have the ability to switch over to manual radio mode, e.g. to be used in another network. Before leaving MOBITEX mode and entering manual mode the terminal shall transmit an INACTIVE packet. This is equivalent to the procedure at power off described in reference R1-09. Before the manual radio mode is entered, the INACTIVE packet should be acknowledged. The terminal should wait 15-20 seconds for the acknowledgement, before entering the manual radio mode.

When the terminal leaves manual radio mode and returns to MOBITEX mode, an ACTIVE packet shall be transmitted according to the procedure at power on, described in reference R1-09.

Note: There are no other requirements made on "Manual radio mode" in the MOBITEX TERMINAL SPECIFICATION, than the requirements made in this chapter.

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2.7 MANUAL ACTIVATION OF MOBILE TERMINALS

Mobile terminals may have the ability to transmit an ACTIVE packet, in order to activate themselves in the network.

This could, for example, be used when the terminal has resumed contact with the network after having been out of radio coverage. The network may have inactivated the terminal during this time, because no traffic have been possible to transfer to the specific terminal.

Normally, an automatic activation is sent to the network after a certain delay-time, specified in reference R1-06. This procedure could be replaced by a manual activation, if the activation delay is considered to be too long.

This activation must be manual, i.e. by operator command.

After power-off, an INACTIVE packet should be sent by the terminal. Before the terminal is switched off, the INACTIVE packet should be acknowledged. The terminal should wait 15-20 seconds for the acknowledgement, before switching off.

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2.8   FLOW CONTROL

MOBITEX is a connection-less, packet-switched, type of network, that uses store-and-forward technique. Complete messages, small or large, are transferred between end-users without establishing any connections.

The end-users are connected to the network via different protocols and bit rates. In order to avoid congestion and buffering problems in the terminals of the end-users, it is recommended that the application layer of the terminals should include a protocol for data flow control. This could be compared to the XON/XOFF-handling of other asynchronous communications and would give a smoother control of the data flow than if it was included in the protocol of lower layers. It will also alert the subscriber to what is happening.

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2.9   NETWORK IDENTIFICATION NUMBER

In order to make it possible for a mobile terminal to change between different networks, the terminals should have this ability. This will make it possible to:

- have different MOBITEX networks existing in the same area and in the same frequency band,

- prevent mobile terminals from unnecessarily changing between networks.(no automatic.change of network).

The network operator decides, in reference R1-06, if terminals should have the ability to roam into and traffic different MOBITEX networks. If that is the case, there should be a possibility for the operator of the mobile terminal to manually change network, by selecting a new network identification number.

The network identification number plan, i.e. the identification number of each network is defined in the document "Network Operator Information" (reference R1-06).

A network identification number can consist of up to 6 digits. There are a number of different methods of selecting a new network, e.g. number dialling, special keys or letter combinations (network names). Please, see chapter "Addressing" in this document.

The selected network identification number should then be transferred to the physical layer, to be used in the signalling with the network.

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2.10 AREA IDENTIFICATION NUMBER

Area identification numbers (area IDs) are used to specify geographical areas. Such an area is denoted as a traffic area and is given a unique area ID by the network.

A list of area IDs specify the area a mobile terminal may traffic. Outside the specified area, two possible cases exist:

1)   the terminal is not operational
2)   the terminal is operational, but may be debited a
      different fee.

When a subscription is registered, the traffic area a mobile terminal may operate, is defined. These area IDs are registered in the network subscription record for each mobile terminal. Information about valid area IDs and whether the terminal should be operational or not outside the traffic area, is transferred to the mobile terminal in a packet via the radio path.

If the terminal should not be operational outside the subscribed traffic area, it should be shown to the user that the mobile has left its traffic area and is not operational. As well, the user should be told when the mobile terminal is within its traffic area again.

Should the terminal be operational, the user must still be notified that the mobile has left its traffic area and might be debited differently. The user should then be told when the mobile terminal is within its normal traffic area again.

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2.11 RADIO CHANNEL LISTS

The mobile terminals uses a list of radio channels,
defined in document "Network operator information"
(reference R1-06, chapter "Scanning procedures"), to
search for new base radio stations (roaming procedure).

In order to speed up the roaming procedure , the terminal
may have the possibility to shorten the channel list. This
could be done from the application, either manually by the
user or automatically (e.g. as in the second example
below). This shortened list is called temporary default
list, and is used by the link layer instead of the
permanent default list. It should also be possible to
change or delete the temporary list from the application.

For example, if the mobile terminal uses a very restricted
traffic area, only those channels applicable to the
present traffic area are required to be used by the
roaming procedure.

Another example is to let the information about which
traffic area (area ID) the mobile terminal is within,
control which channels to be used by the roaming
algorithm.

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3 INTERFACE WITH LOWER LAYERS

Lower layers shall notify whether a message has not been transferred to the network.

All addressing shall be converted to the MOBITEX subscription number (MAN) in respect of a subordinate layer.

For line connection handling, the signals HOOK-OFF and HOOK-ON shall be available to the network layer. These signals indicate whether and when the operator is ready to start and to finish a conversation. They are used to change the line-connection mode in lower layers.

3.1   DATA MESSAGES WITH HIGHER PROTOCOL IDENTIFICATION

A packet of type "HPDATA" in MOBITEX network protocol, has a field for protocol identification number. This indicates the type of higher protocol used, i.e. a protocol above the network layer.

The size of the protocol identification number in HPDATA is one octet. This octet shall be coded

decimal value	indication
0	no protocol identification
1-127	reserved for public protocols
128-255	free to be defined for the subscriber application

Public protocols means protocols that have been registered and assigned a protocol identification number by the network operator (reference R1-06).

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4 MOBITEX SUBSCRIPTION NUMBER (MAN) IN THE TERMINALS

In MOBITEX each subscription and group is allocated a
number of up to 8 digits (decimal). These allocations are
called MOBITEX subscription numbers or 'MAN' and state the
destination and origin of all traffic in MOBITEX. MAN
shall always be stated when addressing between network and
terminal. The designations which are used between user and
terminal shall always be converted to MAN between terminal
and network.

Each terminal shall be capable of addressing messages to,
as well as receive messages from, all MANs in the decimal
number series 0 - 16,777,215.

The terminal shall allow messages to be received for
subscriptions connected to the terminal as follows:

- 1 MAN for the terminal's own subscription,
- 1 MAN for the All Terminals Group *),
- 14 MANs for optional individual group subscriptions and
- 7 MANs for personal subscription

all together 23 different MANs.

*)   All terminals in MOBITEX will belong to one common
      group, the All Terminals Group MAN, dedicated MAN
      number 7. This should be loaded into the terminal by
      the network in the group list, sent on the reception
      of BORN.

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5 MOBITEX TERMINAL SPECIFICATION REFERENCE LIST

This document includes a number of references, made to
other sections in the terminal specification. The list
below shows these references, together with the page(s)
they are made on. Please note that a section could be
referred to several times on the same page.

R1-06, 12, 13, 17, 20, 22, 24, 25
R1-09, 8, 17, 18, 19
R1-18, 14
R1-19, 12

Below are the reference designations listed.

Reference	-	Section
R1-01		Arrangement of the documents
R1-02		MOBITEX System description
R1-03		General description of terminals
R1-04		Terminology
R1-05		References
R1-06		Network operator information
R1-08		Application layer
R1-09		Network layer
R1-11		Interface requirements, fixed terminals
R1-12		Other requirements, fixed terminals
R1-16		Link layer, mobile terminals
R1-17		Physical layer, mobile terminals
R1-18		Radio equipment, mobile terminals
R1-19		Other interfaces, mobile terminals
R1-20		Other requirements, mobile terminals

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ET/SYSC STT *Sit*		1990-02-22	A	MTS09.2
Benämning		Title		
Cantel Mobitex ™		MOBITEX Network layer for terminals		

ABSTRACT

This document describes the network layer for terminals
connected to the Mobitex system.

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1 INTRODUCTION

The specification of the network layer for the terminals connected to the MOBITEX network comprises four documents. These documents are:

    Main document
    ·Appendix A, Packet formats
    Appendix B, Dialogues
    Appendix C, Logical description

The purpose of the different sections of the documents is:

Chapter 1   Is a brief introduction to the documents.

Chapter 2   States the packet classes and the packet names which are relevant to the terminals.

Chapter 3   ·   Defines the general structure of the relevant data packets. (Refer also to Appendix A).

Chapter 4   Defines how data packets are used for dialogue between terminal and network. (Refer also to Appendix B).

Chapter 5   States the set of data packets, that is relevant for each type of terminal.

Chapter 6   Defines which parameters that should be stored at power off for a terminal.

Chapter 7   Defines which parameters that should be transferred to the data link layer.

Appendix A   Together with Chapter 3 this provides an illustration of the individual data packet's structure.

Appendix B   Together with Chapter 4 this provides an illustration of the dialogues between terminal and network.

Appendix C   Shows the interaction between modules within the network layer, as well as between the network layer and the data link layer and the application layer. It also contains a logical description of the network layer.

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1.1 THE NETWORK LAYER IN BRIEF

Communication between the terminal and the MOBITEX network
has been divided into layers according to the model
described in "General description of terminals".

The network layer is the layer which is closest to the
application layers. All communication through interfaces
and external connections must be checked against the given
set of rules for the network layer. All attempts to send
something that does not comply with these rules should be
prohibited.

1.2 PROTOCOLS BETWEEN TERMINAL AND NETWORK IN BRIEF

When a terminal user sends a MOBITEX message the terminal
creates a data packet which it sends to the network. The
data packet should contain the information which the user
wishes to transfer, supplemented with information which is
necessary for the message to reach the correct subscriber
in the network.

Since data transmission is controlled by lower layers,
traffic transmission in the network layer is carried out
through negative acknowledgement.

This means that the message is not normally acknowledged.
The sender is notified however if the message has not
reached the addressee for any reason. In a situation like
this, the message is returned to the sender with an
indication of the cause of the fault.

Messages to groups are excepted from the principle of
negative acknowledgement. It would be a very impractical
procedure to use any type of acknowledgement for these
messages since the groups can be of considerable sizes.

All data packets to be switched between terminals and
networks must follow the structures and procedures stated
in this specification.

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2 PACKETS

MOBITEX is a packet switching network which also allows real time connections between subscribers.

There are two different types of traffic principles used in MOBITEX :

- Packet switched traffic which is transmitted according to the 'store-and-forward principle.

- Circuit switched traffic, used for real time connections between terminals.

2.1 PACKET CLASSES AND PACKET NAMES

2.1.1 Packet switched traffic

In the packet switched traffic in MOBITEX, data packets are used to :

- Transferring information from one subscriber to another subscriber.

- Connecting a circuit switched connection between subscribers thus permitting the transmission of speech or other information, e.g. circuit switched data;

- updating information which is stored in networks and terminals.

2.1.2 Circuit switched traffic

Circuit switched traffic, i.e. traffic which is exchanged over a real time connection is treated briefly in this document.

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2.1.3   Packet classes

Data packets in MOBITEX are divided into a number of packet classes. The four packet classes which are relevant to the terminal's communication with the MOBITEX network are:

- Packet switched subscriber communication - PSUBCOM

- Packet switched emergency communication - PSOSCOM

- Circuit switching for subscriber and   - CSUBCOM
  emergency communication

- Data terminal service communication   - DTESERV

PSUBCOM, PSOSCOM and CSUBCOM are in some parts of the specification called 'user traffic'.

2.1.4   Transmission direction

In the following sections the normal transmission direction(s) for each data packet is given. The direction is stated by: to/from terminal, to terminal or from terminal.

Note that a packet can also be sent in the opposite direction but this concerns a packet that can be not be transferred and is returned to the sender.

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2.2 PACKET SWITCHED SUBSCRIBER COMMUNICATION

Data packets which transfers information from one
subscriber to another subscriber through the MOBITEX
network are included in the packet-switched subscriber
communication.

Internal traffic:

Packets which are included in this group are transferred
between subscribers in MOBITEX.

TEXT	text messages	to/from terminal
DATA	data messages	to/from terminal
STATUS	status messages	to/from terminal
HPDATA	data message with higher protocol identification	to/from terminal

External traffic:

Packets included in this group are switched between a
subscriber in an external telecommunication network
connected to MOBITEX and a subscriber in MOBITEX who also
subscribes to the relevant telecommunications network.

EXTPAK	messages from/to external networks	to/from terminal

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2.3 PACKET SWITCHED EMERGENCY COMMUNICATION

There are certain packets which are used for emergency traffic.

<u>Emergency traffic:</u>

Packets included in this group can be switched with high priority on the radio path between MOBITEX subscribers.

SOS	emergency signal	to/from terminal
SOSINFO	emergency messages	to terminal
SOSACK	emergency acknowledgement	to/from terminal

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2.4   CIRCUIT SWITCHING FOR SUBSCRIPTION AND EMERGENCY
       COMMUNICATION

Data packets are included in circuit switching for
subscription and emergency communication, in order to
establish and disconnect a real time connection.

The data packets in this class are used for communication
between network and terminal.

Circuit switched connections:

Packets which are included in this group are used for
establishing circuit switched connections to be used for
analogue signals such as speech or for real time data
communication, e.g. normal modem.

CONREQ	connection request	to/from terminal
CONFAST	connection request fast	to/from terminal
CONGRA	connection request granted	to terminal
LINSEL	line selected	from terminal
CONORD	conn. order for group call	to terminal
CONREA	ready for connection	from terminal

Emergency connections:

Packets in this group initiate priority emergency
connections to terminals. These emergency connections
permit speech or transfer of circuit connected data
between MOBITEX subscribers.

Emergency connections are given priority over other
circuit switched connections.

SOSCONREQ	emergency connection request	to/from terminal.
SOSCONFAST	emergency connection request fast	to/from terminal.

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External connections:

Packets in this group establish a real time connection between a connected telecommunications network and a terminal. These external connections permits speech or circuit connected data between a MOBITEX subscription and a subscriber in an external network, e.g. the public telephone network.

EXTCONREQ   external connection request   to/from
                                                 terminal

Connections with additional information:

Packets in this group establish real time connections. The packet contains additional information which can be used for stating internal additional numbers (extensions) for other terminals.

ADDCONREQ   .... connection request with   to/from
                   additional information   terminal

ADDCONFAST   connection request with   to/from
                  additional information fast   terminal

Disconnection:

Packets in this group disconnect the real time connection to the terminal.

DISCON   disconnection of connection   to/from
                                                terminal

Line test:

Packets in this group are used for test of a real time connection between the terminal and the network.

CLOOPON   circuit loop test start   to terminal
CLOOPOFF   circuit loop test end   to terminal

Line barring:

Packets in this group are used to bar and open line connections.

LINEOFF   line connection barring   from
                                                terminal

LINEON·   line connection opening   from
                                                terminal

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2.5 DATA TERMINAL SERVICE COMMUNICATION

The data terminal service communication includes data packets which transfer information between subscription/ terminal and network.

The information transferred by these packets update the data in the terminal or network. This data is necessary for traffic switching in the network.

Subscription state:.

Packets in this group change the status of personal subscriptions in the system.

LOGINREQ	login request	from terminal
LOGINGRA	. login request granted	to terminal
LOGINREF	login request refused	to terminal
LOGOUT	logout	from terminal
LOGOUTORD	logout order	to terminal

Terminal status:

Packets in this group change the network's information about the status of the terminal.

BORN	terminal active for the first time	from terminal
ACTIVE	terminal active	from terminal
INACTIVE	terminal not active	from terminal
DIE	terminal is not permitted to send user traffic	to terminal
LIVE	terminal permitted to send user traffic again	to terminal
ROAMORD	roaming order	to terminal
ROAM	roaming message	from terminal
VICESOSRX	re-direction of emergency messages	from terminal
SOSRX	cancel emergency re-direction	from terminal

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Terminal information:

Packets in this group transfer terminal information between the terminal and the network.

GROUPLIST	list of group MAN	to terminal
FLEXREQ	list of personal subscription MAN requested	to terminal
FLEXLIST	list of personal subscription MAN	to/from terminal
INFOREQ	terminal information requested	to terminal
INFO	terminal information	from terminal
TIME	time information	to terminal
AREALIST	list of valid area_IDs	to terminal
ESNREQ	Electronic Serial Number requested	to terminal
ESNINFO	Electronic Serial Number information	from terminal

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3 PACKET FORMATS

The packets which are used in the Mobitex network layer
are given the common designation MobitexPAcKet, or MPAK.
MPAK is used in all communication between the
subscriptions and the network.

An MPAK must never be more than 560 octets long.

3.1 STRUCTURE OF MPAK

This chapter describes the structure of that part of MPAK
which is common to all types of packets sent to and from
terminals. The part which can vary according to different
types of packets is described later.

The design of each individual packet that can be used with
a terminal is described in APPENDIX A.

Each MPAK is divided into different parts according to the
following:

- Common component which is included in all MPAK.

- Address list which is included in certain types of
  MPAK. The MPAK with the address list is formed by
  the terminal and sent to the network. The network
  copies the common component and type dependent
  component of such an MPAK, forms new MPAK and
  sends these to the addressees in the address list.

- Type dependent component which is included in
  certain types of MPAK. The size and application
  depends on the packet concerned.

The contents of the different fields in each component are
described on the following pages.

3.1.1   MPAK without address list

Common component of MPAK:

octet 1-3:

octet 4-6:

octet 7:

octet 8:

Any type-dependent part:

octet 9 etc.

(X = optional 0 or 1)

3.1.2   MPAK with address list

Common component of MPAK:

```
                                         3   2   1
octet  1-3:   |_____  _ _ _ _ _ _____|
                              sender

octet  4-6:   |_____  _ _ _ _ _ _____|
               addressee: MOBITEX network

              8   7   6   5   4   3   2   1
octet  7:     | X   X   X | 0 | X  ·1   X   X |
               state      reserve  subscription
                          flag        flags

              8   7   6   5   4   3   2   1
octet  8:     | 0   0 | 0 | X   X   X   X   X |
               packet  external_  packet
               class   flag       type
```

Address list in MPAK:
```
              8   7   6   5   4   3   2   1
octet  9:     |   number of addressees    |

                                          3   2   1
octet  10-12: |_____ _ _ _ _ _____|
                       addressee  1

octet  13-15: |_____ _ _ _ _ _____|
                       addressee  2

octet  16-18: |_____ _ _ _ _ _____|
                       addressee  3

octet  19-21: |_____ _ _ _ _ _____|
                       .addressee  4

octet  22-24: |_____ _ _ _ _ _____|
                       addressee  5

octet  25-27: |_____ _ _ _ _ _____|
                       addressee  6  .

octet  28-30: |_____ _ _ _ _ _____|
                       addressee  7
```

Any type-dependent component:
```
                                         3   2   1
octet  31 etc |_____ _ _ _ _ _____|
                       (type-dependent)
```
(X = optional 0 or 1)
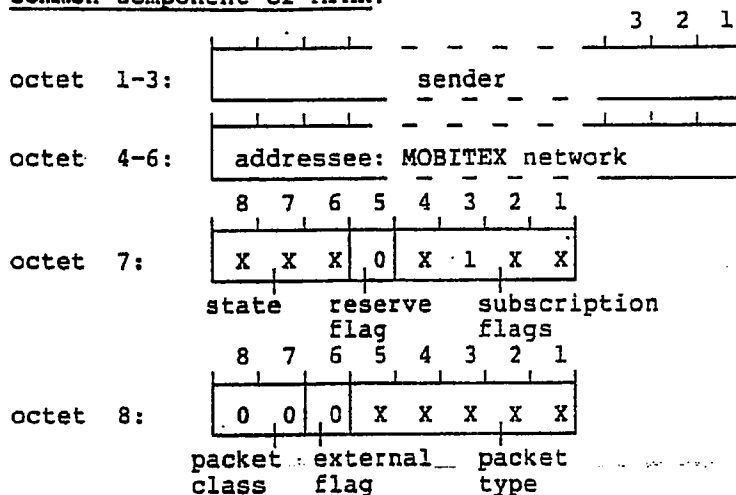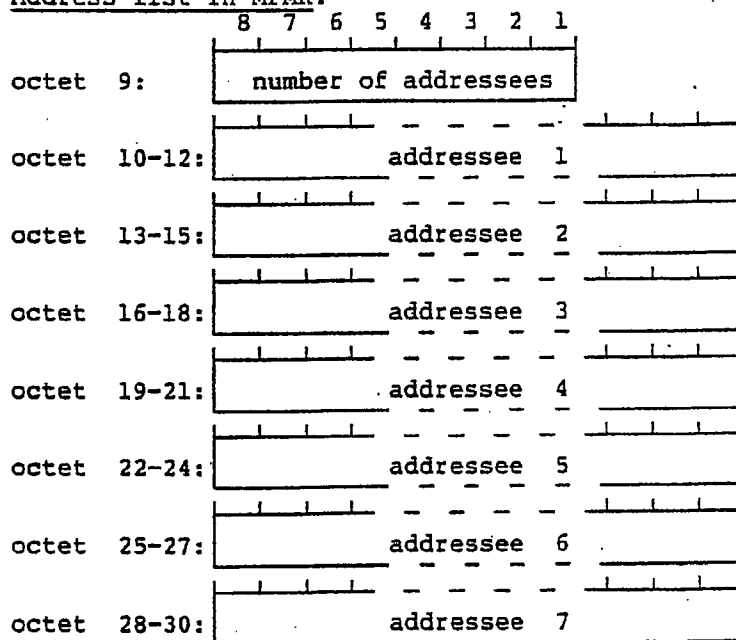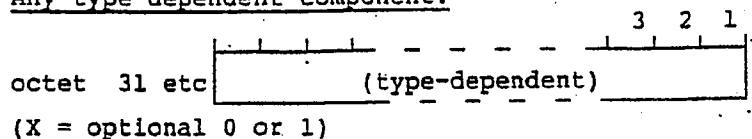
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3.2 COMMON COMPONENT

The common component of MPAK is included in all data packets which are used between terminal and network.

3.2.1 Sender

<u>Sender:</u>   (octet 1-3)

The sender is the subscription or the network which originally generated the packet.

The sender's MAN is given in binary code in 3 octets.

The sender MAN can be a terminal subscription MAN, a personal subscription MAN or a network MAN.

3.2.2 Addressee

<u>Addressee:</u>   (octet 4-6)

The addressee is the subscription, group or network which was originally intended as the receiver - the original destination.

The addressee's MAN is given in binary code in 3 octets.

The addressee MAN can be a terminal subscription MAN, a personal subscription MAN, a group MAN or a network MAN.

<u>Note:</u> The SENDER and ADDRESSEE fields always indicate the <u>original</u> sender and addressee, i.e. the content of the fields are not swapped in returned messages.

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3.2.3 Traffic State

<u>Traffic state</u>   (octet 7, bit 6-8)

The packet's traffic state is stated with 3 bits and can have the decimal values 0-7.

A packet can have one of the following eight states:

State = 0   OK

Meaning: 'OK'
                   No problems have occurred during the
                   switching.

Action: Present the message to the user (please
                   refer to reference R1-08). The traffic
                   state need not be stated.

State = 1   FROM_MAIL

Meaning: 'From mailbox'.
                   This message is coming from the network
                   mailbox.

Action: This message is presented in the same way
                   as other incoming messages (please refer
                   to reference R1-08). It should also be
                   presented to the user, at what time the
                   message was placed in the mailbox. The
                   meaning of the state should be apparent
                   from the presentation.

State = 2:   IN_MAIL

Meaning: 'Has been placed in the mailbox'.
                   The addressee cannot be reached at the
                   moment. This message has been placed in
                   the network mailbox.

Action: This returned message copy is presented in
                   the same way as other incoming messages
                   (please refer to reference R1-08). In
                   certain cases, the presentation of text
                   and data in the type dependent component
                   can be omitted. The meaning of the state
                   should be apparent during the
                   presentation.

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State = 3:   **NO_TRANSFER**

Meaning: 'The addressee can not be reached'. This message cannot be transferred or put in the network mailbox.

Action: This returned message is presented in the same way as other incoming messages (please refer to reference R1-08). In certain cases, the presentation of text and data in the type-dependent component can be omitted. The meaning of the state should be apparent during the presentation.

State = 4:   **ILLEGAL**

Meaning: The message could not be switched by the network.

Action: This returned message is presented in the same way as other incoming messages (please refer to reference R1-08). In certain cases, the presentation of text and data in the type-dependent component can be omitted. The meaning of the state should be apparent during the presentation.

State = 5 :   **CONGEST**

Meaning: Line or radio channels are congested.

Action: This returned message is presented in the same way as other incoming messages (please refer to reference R1-08). In certain cases, the presentation of text and data in the type-dependent component can be omitted. The meaning of state should be apparent during the presentation.

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State = 6:   ERROR

Meaning: 'Technical error'.
                 The message cannot be transferred because
                 of a technical error.

Action: This returned message is presented in the
                 same way as other incoming message (please
                 refer to reference R1-08). In certain
                 cases, the presentation of text and data
                 in the type-dependent component can be
                 omitted. The meaning of the state should
                 be apparent during the presentation.

State = 7:   BUSY

Meaning: .. The B-party is busy with real time
                 connection.

Action: _This. returned message is presented in the
                 same way as other incoming messages
                 (please refer to reference.R1-08). In
                 certain cases, the presentation of text
                 and data in the type dependent component
                 can be omitted. The meaning of the state
                 should be apparent during the
                 presentation.

Note: As states 2, 3, 4, 5, 6 and 7 indicate returned
      messages but the SENDER and ADDRESSEE fields have
      not been swapped, the SENDER field should be used
      for match with the terminal's own MAN:s for these
      states (message returned to original sender).

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3.2.4   Subscription Flags

<u>Subscription flags:</u>   (octet 7, bit 1-4)

A subscription/terminal can raise a number of flags in the common component of MPAK. A flag is raised when its contents will apply. Flags can be raised independently of each other.

A flag is raised when its logic value is 1 and lowered when its logic value is 0.

Flag 1:   **MAILBOX_F**   (octet 7, bit 1)

     MAILBOX_F = 0 : Must not be placed in the network
                     mailbox.
     MAILBOX_F = 1 : May be placed in the network
                     mailbox.

Flag 2:   **DIGITAL_F**   (octet 7, bit 2)

     DIGITAL_F = 0 : Digital route not required.
     DIGITAL_F = 1 : Digital route required.

Flag 3:   **SENDLIST_F**   (Octet 7, bit 3)

     SENDLIST_F = 0 : Address list is not included.
     SENDLIST_F = 1 : Address list included.

Flag 4:   **UNKNOWN_F**   (octet 7, bit 4)

     UNKNOWN_F = 0 : Normal position
     UNKNOWN_F = 1 : Subscription not here.

<u>Reserve flag:</u>   (octet 7, bit 5)

This flag is reserved until further notice.

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3.2.5 Packet class

Packet class: (octet 8, bit 7-8

This field states the class to which the packet belongs by 2 bits in the common component of MPAK. The packet class can have the decimal values 0-3.

·The four classes are:

```
Packet class = 0:        PSUBCOM
Packet class = 1:        PSOSCOM
Packet class = 2:        CSUBCOM
Packet class = 3:        DTESERV
```

3.2.6 External Flag

External flags: (octet 8, bit 6)

The external flag is raised to indicate that the packet is being used in traffic with an external network.

This flag must be lowered to indicate internal traffic in MOBITEX.

```
EXTERN_F = 0 :        Internal traffic
EXTERN_F = 1 :        External traffic
```

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3.2.7 Packet Type

Packet type: (octet 8, bit 1-5)

Each packet name corresponds to a packet type together with a position on the EXTERN_F flag. (Refer to 'Packet classes and packet name' for more details).

Packet types are stated with 5 bits in this field. Packet types can have the decimal values 0-31.

The following types of packets are used for terminals:

Within packet class = 0, i.e. PSUBCOM:

EXTERN_F=0:	packet type=1:	TEXT
	packet type=2:	DATA
	packet type=3:	STATUS
	packet type=4:	HPDATA
EXTERN_F=1:	packet type=1:	EXTPAK

Within packet class = 1, i.e. PSOSCOM:

EXTERN_F=0:	packet type=1:	SOS
	packet type=2:	SOSINFO
	packet type=3:	SOSACK

Within packet class = 2, i.e. CSUBCOM:

EXTERN_F=0:	packet type=1:	CONREQ
	packet type=2:	ADDCONREQ
	packet type=3:	CONGRA
	packet type=4:	CONORD
	packet type=5:	CONREA
	packet type=6:	DISCON
	packet type=7:	CLOOPON
	packet type=8:	CLOOPOFF
	packet type=9:	LINEON
	packet type=10:	LINEOFF
	packet type=11:	CONFAST
	packet type=12:	ADDCONFAST
	packet type=13:	LINSEL
	packet type=17:	SOSCONREQ
	packet type=27:	SOSCONFAST
EXTERN_F=1:	packet type=2:	EXTCONREQ

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Within MPAK packet class = 3, i.e. DTESERV:

```
EXTERN_F=0:      packet type= 1:     LOGINREQ
                 packet type= 2:     LOGINGRA
                 packet type= 3:     LOGINREF
                 packet type= 4:     LOGOUT
                 packet type= 5:     LOGOUTORD
                 packet type= 6:     BORN
                 packet type= 7:     ACTIVE
                 packet type= 8:     INACTIVE
                 packet type= 9:     DIE
                 packet type=10:     LIVE
                 packet type=11:     ROAMORD
                 packet type=12:     ROAM
                 packet type=13:     VICESOSRX
                 packet type=14:     SOSRX
                 packet type=15:     GROUPLIST
                 packet type=16:     FLEXREQ
                 packet type=17:     FLEXLIST
                 packet type=18:     INFOREQ
                 packet type=19:     INFO
                 packet type=20:     TIME
                 packet type=21:     AREALIST
                 packet type=22:     ESNREQ
                 packet type=23:     ESNINFO
```

Packets not listed above are reserved.

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3.3   ADDRESS LIST

If an address list is included after the common component of the MPAK, this should be stated with a raised flag 'SENDLIST_F' in the MPAK common component.

An address list must always begin at octet 9 and end at octet 30.

Note that the address list always has a length of 22 octets, irrespective of how many addresses will be read by the network.

The address list should be designed as shown in chapter 'MPAK with address list'.

The field 'number of addresses' states how many of the following 7 address fields that are valid. The MAN for the respective subscription should be stated in the 7 address fields.

Empty address fields should be filled with zeros when creating the address list.

A packet with address list is returned to the sending terminal if the packet type is not allowed or if an error occurs before the network has unpacked the address list.

3.4   TYPE-DEPENDENT COMPONENT

If an address list is included in MPAK, the type-dependent component begins with octet 31 otherwise it begins with octet 9 directly after the common component of MPAK.

Further information on the type dependent fields is given for the respective packet in Appendix A.

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4 PROTOCOL

Some of the packets which the terminal sends to the
network should be distributed to another subscriber. Other
packets have the network as destination.

Each terminal should be capable of storing a specified
number of MOBITEX subscription numbers (MAN). These MAN
are divided into MAN for terminal subscription, MAN for
groups and MAN for personal subscriptions.

Only packets which are sent to terminals and which have
one of all the terminal's subscriptions as addressee or
sender will be handled. These packets are the only ones
which may be notified to the user. If any other packet
reach the network layer, it should be sent back to the
network with Subscription flag UNKNOWN_F = 1. See chapter
4.5.2 Flags. .

All interchange of packets between terminal and network
should be according to a protocol. This chapter describes
the protocols for the dialogues which occur in the network
layer between the terminal and network in general terms.

Appendix B describes each dialogue separately. The
dialogues are divided into a number of groups which on the
whole agree with the division of packets into packet
classes.

All packets which are referred to in this chapter are
referred to in PACKET CLASS AND PACKET NAME and their
structures are defined in PACKET FORMATS and APPENDIX A.

4.1   TRAFFIC HANDLING PRINCIPLES

Packets are normally not acknowledged on the network layer
level. However, the sender is informed if a packet has not
reached the addressee. In this case, the packet is
returned to the sender with an indication of the cause of
the fault. The fault is given in the traffic state field
of the packet.

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4.2 ACTIVATION/INACTIVATION

In order to avoid transmission attempts to terminals which cannot be reached, an activation/inactivation procedure is included in the terminals.

Inactivation :

The terminal should inactivate itself by automatically transmitting an INACTIVE packet to the network

1) before it is powered off.

2) when the terminal's message buffer is full and the terminal is incapable of handling more packet from the network.

A terminal may also be inactivated by the network.
This occurs if the network has repeatedly failed to reach the terminal with traffic.

The terminal and its personal subscriptions are then regarded as inactive by the network until it receives an ACTIVE packet from the terminal. When a subscription is inactive, traffic to it is forwarded to the network mailbox or returned to the sender without attempt to reach the terminal. Messages are stored in the network mailbox according to the principle described in chapter 'MOBITEX NETWORK MAILBOX' in this document.

If contact is lost during the attempts to transmit the INACTIVE packet no further attempts are made. If contact is already lost when INACTIVE should be sent, no transmission at all is attempted.

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Activation :

The terminal should activate itself by automatically transmitting an ACTIVE packet to the network :

    1) When it is switched on.

    2) When the terminal's message buffer has space for at least 6 messages of maximum length.

    3) When the data link layer in the mobile terminal indicates that the terminal should activate itself. This case arises when the data link layer has lost contact with the base radio station, and the contact is re-established with the same base station again.

    4) On order from the application layer.

It is also possible to insert a delay time before sending the ACTIVE packet to the network. If user traffic from the terminal is generated during this delay period, the transmission of the ACTIVE packet could be omitted.

Two different delays are defined :

    1) Activation delay after power-on.

    2) Activation delay after lost contact with the network.

Requirements on these delays are specified in the Network operator information, please see R1-06.

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4.3 EMERGENCY TRAFFIC

The handling of emergency traffic can be given priority in the network and should also be given priority in terminals.

When an emergency message reaches a terminal, the user should immediately be given clear notice that the emergency message has arrived. It may also be possible for the message to interrupt another activity so that it can be presented immediately in its entirety.

When an emergency signal is initiated, the sending of the emergency signal from the terminal should be given priority over the sending of other messages. Assume that the user have ordered the terminal to send a text message. An emergency message is initiated by the user at the same time as the text message is to be transmitted. In this case the transmission of the text message should be interrupted, and the emergency message should be transferred.

4.4 MOBITEX NETWORK MAILBOX

Terminal and personal subscriptions can subscribe to the Mobitex network mailbox facility.

If the addressee of a message can not be reached by the network, the message can be stored in the network mailbox. A message is stored in the network mailbox if :

      1) the sender of the message indicates so by using the subscription flag MAILBOX_F

and

      2) the addressee subscribes to the mailbox service.

If the message is stored in the mailbox, a copy of the message will also be returned to the sender with traffic state IN_MAIL.

When the subscription is activated or have finished a real time connection, the packets which have been placed in the mailbox are sent to the subscription. If the packet had traffic state OK when it arrived at the mailbox, the traffic state of the packet has changed to FROM_MAIL when it is sent from the mailbox to the subscription. Packets with traffic states other than OK will pass the mailbox with an unchanged traffic state.

Otherwise there is no change in the contents of the packet.

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4.5 CIRCUIT SWITCHED CONNECTION

A circuit switched connection in MOBITEX is a real time connection which is primarily used for speech connections. A circuit switched connection may also be used for circuit switched data.

Circuit switched connections are always bi-directional. The base stations operates in duplex. The mobile terminals operates in two-frequency simplex or duplex communication mode.

There are two different methods of requesting a line connection, by using MPAK :

      1) CON**R (CONREQ, ADDCONREQ, SOSCONREQ, EXTCONREQ)
or
      2) CON**F (CONFAST, ADDCONFAST, SOSCONFAST)

If a line connection is initiated with a CON**R from the A-party, the network requires that the B-party terminal informs the network when HOOK-OFF is done by sending a CONREA packet. If the line connection is initiated with a CON**F, no CONREA should be sent to the network. This means that the line connection is established when the B-party has successfully received the CON**F packet. Please refer to Appendix A for description of packet formats and to Appendix B for line connection dialogues.

Three different protocols are used for circuit switched connection :

      Prot_1:   Is used in mobile terminals and fixed terminals with one line for real time connection.

      Prot_2A: Is used in fixed terminals with several lines for real time connections. The network selects lines for real time connections.

      Prot_2B: Is used in fixed terminals with several lines for real time connections. The terminal selects lines for real time connections.

For more information about differences between Prot_2A and Prot_2B see appendix A and appendix B.

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4.6   THE USE OF FIELDS IN THE COMMON COMPONENT IN MPAK

This section gives a guideline how the fields in the common component in MPAK are to be used. The structure of the fields are defined in chapter 'PACKET FORMATS' in this document.

4.6.1   Traffic states

In a mobile communication network, certain situations can arise when the network cannot transfer the message.

The traffic state field is used by the network to inform the terminal or subscription of the state of each individual packet. The reason for returning a packet to the terminal is stated in the traffic state field.

Returned packets originating from an MPAK with address list can be returned without address list if the network has already formed the individual messages, otherwise the original MPAK with address list is returned.

- In each data packet only one traffic state can be indicated in the traffic state field.

- The traffic state relates only to the packet in which it is stated.

- A data packet will always have traffic state OK when it is generated by a terminal.

- The terminal must never change the traffic state of a packet.

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4.6.2 Flags

The terminal should be capable of raising a number of
flags in the common component of the MPAK. The terminal
has no reason to read what are known as subscription flags
for the incoming messages. External flags however are of
interest to the terminal.

- Flags are raised independently of each other.

- A flag is raised when its logic value is 1 and lowered
  when its logic value is 0.

MAILBOX_F
     is used by the terminal to indicate whether the
     network is allowed to store the packet in the
     network.mailbox if the packet cannot be forwarded to
     the addressee. MAILBOX_F can be raised by a terminal
     when ordered by the user, or by default.

DIGITAL_F
     is used by the terminal to indicate that a digital
     route is required for the requested circuit switched
     connection. DIGITAL_F should not be used when
     requesting circuit switched connection to groups.
     DIGITAL_F can be raised by the terminal when ordered
     by the user.

     NOTE :
     DIGITAL_F should always be set = 0.

SENDLIST_F
     indicates that the packet includes an address list.
     This means that the network will create a copy of
     MPAK common component and MPAK type-dependent
     component, addressed to each addressee in the
     address list when the packet enters the network. The
     network considers each copy as an independent packet
     generated by the sender. SENDLIST_F is raised by the
     terminal when the sender gives several addresses for
     a message.

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UNKNOWN_F
If the addressee (or the sender in case of returned
packets, traffic states 2, 3, 4, 5, 6 and 7) is not
in the terminal's list of subscriptions, the
terminal raises this flag and returns the message to
the sender. UNKNOWN_F is therefore raised for a very
specific error situation.

Exception: In case this error occurs for a CONREQ,
ADDCONREQ, SOSCONREQ, EXTCONREQ, CONFAST, ADDCONFAST
or a SOSCONFAST packet it must not be returned to
the network. Instead, a DISCON packet should be sent
to the network with the UNKNOWN_F flag set.

EXTERN_F
Is raised to indicate that the packet refers to
traffic with an external telecommunication network,
connected to MOBITEX.

RESERV_F
Should always be set = 0, until further notice.

4.6.3   When generating MPAK

The fields in the common component of the MPAK will be used according to the following for all packets generated by the terminal. There are restrictions concerning the sender and addressee. These restrictions are described at the presentation of each individual packet in appendix A.

Sender:

The sender is the MAN which originally sent the message. The MAN may denote a terminal subscription or a personal subscription logged-in to the terminal.

Addressee:

The addressee is the MAN of the originally intended final receiver of the packet. The MAN may denote a terminal subscription, a personal subscription, a group, the MOBITEX network or an external network.

Traffic state:

The traffic state is always = OK

Flags:

MAILBOX_F:
        - optional for a number of packets (see Appendix A),
        - lowered for all other packets.

DIGITAL_F:
        optional for a number of packets (CONREQ, ADDCONREQ, SOSCONREQ, EXTCONREQ, CONFAST, ADDCONFAST and SOSCONFAST), lowered for other packets.

        NOTE :
        DIGITAL_F should always be = 0.

SENDLIST_F:
        - optional for TEXT, DATA, HPDATA and STATUS
        - lowered for other packets.

UNKNOWN_F:
        - lowered when generating a packet.

EXTERN_F:
        - raised if the addressee is an external network.
        - otherwise it is lowered.

4.6.4   When receiving MPAK

Data packets can be received by terminal at one of the following occasions:

1) Normal case :

    the packet is sent to the addressee, MAN match with ADDRESSEE field

2) Returned packets from network :

    the packet is returned to the original sender, MAN match with SENDER field. (The packet was returned by the network since it could not be transferred to the addressee)

3) Packets to unknown subscriber in terminal :

    the received packet is addressed to a subscriber that is unknown to the terminal. This may occur if the packet was addressed to a personal subscription that has logged-out at the instant the packet was received.

1)   Normal case :

In the normal case the message is transferred from the sender to the addressee. In this case the MPAK common component is as follows :

Sender:

The terminal subscription, personal subscription or network MAN which originally created the packet.

Addressee:

One of the possible MAN:s of the receiving terminal (terminal subscription, personal subscription or group).

Traffic state:

OK or FROM_MAIL. (The latter applies if the packet has been stored in the network mailbox).

Flags:

EXTERN_F is raised if this is an external packet.

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2) <u>Returned packets from the network :</u>

In this case, the packet was originally generated from one of the terminal's subscriptions but for some reason it has been returned by the network. The reason for the network to return the packet is stated in the traffic state field.

Returned packets must not be sent back to the network, but should be presented to the application layer.

<u>Sender:</u>

The original sender of the packet, which in this case is one of the subscriptions of the terminal (terminal or personal subscription).

This field should be used to find an address match with one of the subscriptions at the terminal.

<u>Addressee:</u>

The originally intended receiver of the packet. Normally a subscription MAN, group MAN or network MAN different from the MAN:s of the terminal. It should not be used to find an address match.

<u>Traffic state:</u>

One of the following: IN_MAIL
                           NO_TRANSFER
                           ILLEGAL
                           CONGEST
                           ERROR
                           BUSY

<u>Flags:</u>

When SENDLIST_F is set, the returned packet contains an address list and must be treated accordingly.

3) Packets to unknown subscriber in the terminal

If the addressee matching procedure mentioned in case 1) and 2) above fails, the packet should be returned to the network with the UNKNOWN_F flag raised. No other changes in the packet is allowed. Please refer to chapter 'When returning MPAK to the network' in this document.

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4.6.5 When returning MPAK to the network.

When returning a MPAK to the network the following rules apply:

Sender:

Unchanged.

Addressee:

Unchanged.

Traffic state:

Unchanged.

Flags:

The UNKNOWN_F flag should be raised by the terminal returning the packet.

All other flags must be unchanged.

Exception: In case a CONREQ, SOSCONREQ, ADDCONREQ, EXTCONREQ, CONFAST, ADDCONFAST or a SOSCONFAST packet is received under the circumstances described here, it must not be returned. Instead, a DISCON packet should be sent to the network with the UNKNOWN_F raised.

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4.6.6 MPAK returned by the link layer.

In this case the packet is returned by the link layer to the network layer. The reason for this could be that the link layer has lost contact with the network. It must be noted that the packet may have been successfully received by the network, but the acknowledgement from the network to the terminal has been lost.

Sender:

The original sender of the packet.

Addressee:

The originally intended receiver of the packet.

Traffic state :

Not changed.

Flags :

No flags has been changed by the link layer.

Returned packet from the link layer should be considered
as 'not transmitted' and must be treated as follows:

PSUBCOM: The message is indicated as a "not
                transmitted" message, and sent to the
                application layer.

PSOSCOM: The message is indicated as a "not
                transmitted" message, and sent to the
                application layer.

CSUBCOM: The message is to be considered as a
                disconnection of the actual line
                connection.
                The message is indicated as a "not
                transmitted" message, and sent to the
                application layer.

DTESERV:LOGINREQ/LOGOUT:
                The message is indicated as a "not
                transmitted" message, and sent to the
                application layer.

DTESERV:ACTIVE/INACTIVE:
                The message is indicated as a "not
                transmitted" message, and sent to the
                application layer.

DTESERV:SOSRX/VICESSOSRX:
                The message is indicated as a "not
                transmitted" message, and sent to the
                application layer.

4.6.7   MPAK returned by the network layer to the
         application layer

When the network sends MPAK DIE the terminal is prevented
from sending any user traffic.

The network layer in terminal should notify the
application layer when it receives a DIE packet.
Packets sent from the application layer when the network
layer is in the DIE state should be returned to the
application layer.

The DIE state is valid until the network layer in the
terminal receives a LIVE packet from the network. The LIVE
packet should also be presented to the application layer
in order to indicate that user traffic is allowed to send.

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4.7 MESSAGE BUFFERS IN TERMINALS

The terminal must have a buffer for received, but unread messages. This buffer must be able to store at least 6 messages of maximum length.

If the buffer becomes full, an INACTIVE packet should be sent to the network. Traffic to the terminal will then be directed to the network mailbox or returned to the sender.

When the buffer is full this should also be presented to the user.

When there is space for at least 6 new messages, then an ACTIVE packet should be sent. Normal traffic between the terminal and the network is then resumed.

4.7.1 - Emergency traffic-buffers

Terminals should always have enough memory space both for generating and receiving emergency traffic.

4.7.2 Sending traffic while buffer is full

The application may send any user traffic (PSUBCOM), while the buffer is full. The terminal should, however, send an INACTIVE packet immediately afterwards.

But when an emergency packet is initiated, this emergency packet should be transmitted immediately without sending an INACTIVE afterwards.

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4.8 ELECTRONIC SERIAL NUMBER (ESN) CHECK

Electronic Serial Number (ESN) check will protect subscribers from unauthorized use of terminals.

The following packets includes the ESN :

> BORN
> ROAM
> ACTIVE

To request the ESN from the terminal two MPAK are included :

> ESNREQ
> ESNINFO

Fixed terminals without the ESN check function should also use the BORN and ACTIVE packets as defined in this specification. Please see R1-06 for ESN requirements for fixed terminals.

The definition of the ESN format in the packets are described in R1-06.

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5 RELEVANT PACKETS FOR FIXED AND MOBILE TERMINALS

Each terminal type should be capable of receiving all packets without any malfunction.

The absolute minimum required of a terminal to be approved for connection to MOBITEX is that it is capable of handling the following packets in a correct manner:

```
        mobile terminal:              fixed terminal:
        DTESERV.BORN                  DTESERV.BORN
                ACTIVE                        ACTIVE
                INACTIVE                      INACTIVE
                DIE                           DIE
                LIVE                          LIVE
                ROAMORD                       GROUPLIST
                ROAM                          TIME
                GROUPLIST
                INFOREQ
                INFO
                TIME
                AREALIST
                ESNREQ
                ESNINFO
```

If personal subscriptions are permitted the following packets must also be handled :

```
        DTESERV.LOGINREQ
                LOGINGRA
                LOGINREF
                LOGOUT
                LOGOUTORD
                FLEXREQ
                FLEXLIST
```

If emergency traffic is permitted the following packets must also be handled :

```
        PSOSCOM.SOS
                SOSINFO
```

optional to emergency receivers:

```
        PSOSCOM.SOSACK
        DTESERV.VICESOSRX
                SOSRX
```

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If line connection is permitted the following packets must
also be handled :

        CSUBCOM.CONREQ
                CONFAST
                SOSCONREQ
                SOSCONFAST
                ADDCONREQ
                ADDCONFAST
                EXTCONREQ
                CONREA
                DISCON
                CONORD

        optional for fixed terminal
        CSUBCOM.CLOOPON
                CLOOPOFF
                ·LINEON
                LINEOFF

        additional for fixed terminal according to PROT_2A
        CSUBCOM.CONGRA

        additional for fixed terminal according to PROT_2B
        CSUBCOM.LINSEL

Handling of packets in the class PSUBCOM depends on the
the application and are optional :

        PSUBCOM.TEXT
                DATA
                STATUS
                HPDATA
                EXTPAK

6 PARAMETERS TO BE STORED AT POWER OFF

The following network layer parameters are to be stored also during power off in order to be available immediately at power on:

- terminal subscription MAN and Electronic Serial Number (ESN) should be stored permanently in such a way that they are impossible to change by software or by unauthorized persons.

- current status originating from the reception of DIE or LIVE packets,

- list of current group MAN:s (GROUPLIST),

- list of personal subscriptions currently logged-in to the terminal (FLEXLIST).

- list of area IDs (AREALIST)

Note: At power up it is recommended that the stored information in the network layer are controlled against a checksum. If the checksum is found to be incorrect a BORN packet should be sent to the network in order to update the information.

7 PARAMETERS TO BE TRANSFERRED TO THE DATA LINK LAYER

The following network layer parameters are to be transferred to the data link layer :

- list of current group MAN:s (GROUPLIST),

- list of area IDs (AREALIST)

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8 MOBITEX TERMINAL SPECIFICATION REFERENCE LIST

This document includes a number of references, made to
other sections in the terminal specification. The list
below shows these references, together with the page(s)
they are made on. Please note that a section could be
referred to several times on the same page.

R1-06, 27, 40
R1-08, 17, 18, 19

Below are the reference designations listed.

Reference	Section
R1-01	Arrangement of the documents
R1-02	MOBITEX System description
R1-03	General description of terminals
R1-04	Terminology
R1-05	References
R1-06	Network operator information
R1-08	Application layer
R1-09	Network layer
R1-11	Interface requirements, fixed terminals
R1-12	Other requirements, fixed terminals
R1-16	Link layer, mobile terminals
R1-17	Physical layer, mobile terminals
R1-18	Radio equipment, mobile terminals
R1-19	Other interfaces, mobile terminals
R1-20	Other requirements, mobile terminals

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ABSTRACT

This document describes the structures of all data packets which are used between terminals and the MOBITEX network. The criteria for generating the packets and actions to be taken when receiving packets are also described for each individual data packet. Mobitex data packets are denoted MPAK (Mobitex Packets).

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1 INTRODUCTION

1.1 GENERAL

Fields that appear in the type dependent part of several packet types are defined in chapter 2 in this document.

Chapter 3 - 6 gives a detailed description of each individual MPAK.in the PSUBCOM, PSOSCOM, CSUBCOM and DTESERV classes, respectively.

Documents in this section:

Main document   contains a general description of the packet structure and a detailed specification of the common part of the packets.

Appendix A   provides an individual description of the structure of each MPAK.

Appendix B   provides an illustration of the dialogues between the terminal and the network where MPAK are used.

Appendix C   contains a description of the interaction between modules within the network layer, as well as the interaction between the network layer and the data link layer and application layer. It also contains a logical description of the network layer in the mobile terminal.

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2 FIELDS COMMON TO SEVERAL TYPE DEPENDENT COMPONENTS

The following fields appear in the type dependent
components of several packet types.

MAN: 3 Octets used as subscription number.
                        The MAN is in the range of 0-16,777,215
                        decimal, with restrictions according to
                        the specification in reference R1-06.

                        MAN will always be binary coded as 24
                        bits, grouped in 3 octets.

                        Example:
                        MAN 12345678 (decimal) is the same as
                        BC614E hexadecimal. The binary code will
                        be:

                        8 7 6 5 4 3 2 1

octet 1: | 1 0 1 1 1 1 0 0 | (Hex: BC)

octet 2: | 0 1 1 0 0 0 0 1 | (Hex: 61)

octet 3: | 0 1 0 0 1 1 1 0 | (Hex: 4E)

number of MAN: 1 octet.

connection   1 octet.
identity: (0-255 decimal)
                 Description: Selected by the A party for
                 the connection. The connection identity is
                 cyclically incremented by one from 1 to
                 255. Connection identity 0 implies that
                 the packet is relevant irrespective of
                 current connection ID. Only fixed
                 terminals with more than one line for line
                 connections and the MOBITEX network can
                 generate packets with connection identity
                 equal 0. Please refer to appendix B.

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line number: 1 octet
(0-255 decimal)
Description: Used for line connection.
Line number 0 is used by mobile terminals
and fixed terminals with only one single
line for line connection. For fixed
terminals with more than one line for line
connections, the line number corresponding
to each specific line must be defined at
the installation of the terminal to the
network.

protocol
identification
number: 1 octet
(0-255 decimal)
Selected by A-party.
Description: This field indicates that an
end- to-end protocol, i.e. a protocol
above the network layer, between A-party
and B-party is in use.

0 decimal means no protocol identifi-
cation.

1-127 decimal means that a protocol is in
use. The protocol identification number is
administered by the network operator. A
terminal should not use protocol
identification numbers between 1-127
without having registered the number at
the network operator.

128-255 decimal as protocol
identification number may be used by a
terminal without restrictions.

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time: The time field should be cleared (0) when
sending from a terminal. The time is
inserted when the packet enters the the
first node in the network. The time
indication can be used by the receiving
terminal when receiving the MPAK.

The time in MOBITEX is given as 'MOBITEX
minute' in 3 octets, indicating how many
minutes have elapsed since 1985-01-01
00:00 (MOBITEX Local Time).

— —

The following algorithm is used to calculate MOBITEX local
time from the 'MOBITEX minute':

hour = (MOBITEX_minute MOD 1440) DIV 60

minute = (MOBITEX_minute MOD 1440) MOD 60

MD = MOBITEX_minute DIV 1440

MT=
(4291+10*(MD-(36525*((100MD+30690)DIV36525))DIV 100))DIV10

year = 1984 + (100*MD + 30690) DIV 36525 + MT DIV 429

month = (100*MT) DIV 3061 - 1 - 12*(MT DIV 429)

day = MT - (((100 * MT) DIV 3061) * 3061) DIV 100

In the expressions above, DIV stands for whole number
division and MOD for the rest of the whole number division
(7 DIV 3 = 2 and 7 MOD 3 = 1).

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Example :

Assume that time indication is 876241 decimal (0D5ED1 hexadecimal). The field for time indication then looks as follows:

```
            8  7  6  5  4  3  2  1
          ┌──┬──┬──┬──┬──┬──┬──┬──┐
octet  1: │ 0  0  0  0  1  1  0  1│  (Hex: 0D)
          └──┴──┴──┴──┴──┴──┴──┴──┘
          ┌──┬──┬──┬──┬──┬──┬──┬──┐
octet  2: │ 0  1  0  1  1  1  1  0│  (Hex: 5E)
          └──┴──┴──┴──┴──┴──┴──┴──┘
          ┌──┬──┬──┬──┬──┬──┬──┬──┐
octet  3: │ 1  1  0  1  0  0  0  1│  (Hex: D1)
          └──┴──┴──┴──┴──┴──┴──┴──┘
```

In this example, the variables will have the following values:

hour = 12

minute = 1

MD = 608

MT = 307

year = 1986

month = 9

day = 1

Thus the time is 1986-09-01 12:01

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3   PSUBCOM

This chapter describes all "packet switched subscriber communication" packets.

3.1   <u>TEXT (text message) without address list:</u>

<u>Designated sender:</u>

Terminal subscription or personal subscription.

<u>Designated addressee:</u>

Terminal subscription, personal subscription or group.

<u>Raised flags:</u>

Optional: MAILBOX_F

<u>Criteria for generating the packet:</u>

The user or the application has ordered sending of the text information.

<u>The network's normal action when receiving the packet</u>

The network dispatches the packet to the designated address.

<u>The terminal's normal action when receiving the packet</u>

The information in the packet is stored, processed and/or presented to the user of the addressed subscription, according to reference R1-08.

<u>Length of the packet:</u>

The length can vary between 12 and 523 octets.

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	Datum Date 1990-02-19	Rev A	Fil. File MTS09A.2

TEXT without address list as generated by a terminal

MPAK-COMMON COMPONENT:

octet 1-3:

```
┌─┬─┬─┬─ ─ ─ ─ ─┬─┬─┬─┐
│       sender        │
└─┴─┴─┴─ ─ ─ ─ ─┴─┴─┴─┘
```

octet 4-6:

```
┌─┬─┬─┬─ ─ ─ ─ ─┬─┬─┬─┐
│      addressee      │
└─┴─┴─┴─ ─ ─ ─ ─┴─┴─┴─┘
```

octet 7:

0	0	0	0	0	0	0	X

octet 8:

0	0	0	0	0	0	0	1

TYPE DEPENDENT COMPONENT:

octet 9-11:

```
┌─┬─┬─┬─ ─ ─ ─ ─┬─┬─┬─┐
│       time          │
└─┴─┴─┴─ ─ ─ ─ ─┴─┴─┴─┘
```

octet 12: etc

```
┌─┬─┬─┬─ ─ ─ ─ ─┬─┬─┬─┐
│  text (max. 512 octets) │
└─┴─┴─┴─ ─ ─ ─ ─┴─┴─┴─┘
```

(X = optional 0 or 1)

text: 1-512 octets.
               According to 'MOBITEX text code'.

Cantel Mobitex -	Nr. Nr. 51/1056 - A 296 5171/2 Ue		
	System - Data 1990-02-19	Rev A	Fl. No MTS09A.2

3.2 TEXT (text message) with address list:

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

The network is stated in the ordinary addressee field.

The intended message receivers are stated in the address list. The address list contains a list of subscription numbers, each of which can designate a terminal subscription, a personal subscription or a group. Compare with the ordinary addressee field in 'TEXT' without address list.

Raised flags:

Requirement: SENDLIST_F
Optional   : MAILBOX_F

Criteria for generating the packet:

The user or the application has ordered sending of the text information to a number of designated addressees.

The network's normal action when receiving the packet:

The network will make up an MPAK without address list for each of the addressees in the address list, taking the type dependent component from the original packet and putting the addressees from the address list into the addressee field of the respective new packets. The new packets are then dispatched to the designated addressees.

The terminal's normal action when receiving the packet:

The terminal only receives this packet as a returned packet.

Length of the packet

The length can vary between 34 and 545 octets.

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TEXT with address list as generated by a terminal

MPAK COMMON COMPONENT:

octet 1-3:   [sender]

octet 4-6:   [addressee: MOBITEX network]

octet 7:   [0 0 0 | 0 | 0 1 0 X]

octet 8:   [0 0 0 | 0 0 0 0 1]

ADDRESS LIST:

octet 9:   [number of addressees]

octet 10-12:   [addressee 1]

octet 13-15:   [addressee 2]

octet 16-18:   [addressee 3]

octet 19-21:   [addressee 4]

octet 22-24:   [addressee 5]

octet 25-27:   [addressee 6]

octet 28-30:   [addressee 7]

TYPE DEPENDENT COMPONENT:

octet 31-33:   [time]

octet 34 etc   [text (max. 512 octets)]

(X = optional 0 or 1)

text: 1-512 octets.
According to 'MOBITEX text code'.
Please refer to R1-06

Cantel Mobitex	Nr No 51/1056 - A 296 5171/2 Ue		
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3.3 DATA (data messages) without address list:

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

Terminal subscription, personal subscription or group.

Raised flags:

Optional: MAILBOX_F

Criteria for generating the packet:

The user or the application has ordered sending of the data information.

The network's normal action when receiving a packet:

The network dispatches the packet to the designated addressee.

The terminal's normal action when receiving a packet:

The information in the packet is stored, processed and/or presented to the user of the addressed subscription, according to reference R1-08.

Length of the packet:

The length can vary between 12 and 523 octets.

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	Datum Date 1990-02-19	Rev A	Fil File MTS09A.2

DATA without address list as generated by a terminal

MPAK COMMON COMPONENT:

octet 1-3:   sender

octet 4-6:   addressee

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X |

octet 8: | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

TYPE DEPENDENT COMPONENT:

octet 9-11:   time

octet 12:etc   data (max. 512 octets)

(X = optional 0 or 1)

data: 1-512 complete octets.
                 Optional coding.

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A 292 5153-3

Cantel Mobitex ~	N: N, 51/1056 − A 296 5171/2 Ue		
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3.4 DATA (data messages) with address list:

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

The network is stated in the ordinary address field.

The intended message receivers are stated in the address list. The address list contains subscription numbers, each of which can designate a terminal subscription, a personal subscription or a group. Compare with the ordinary address field in 'DATA' without address list.

Raised flags:

Requirement: SENDLIST_F
Optional: MAILBOX_F

Criteria for generating the packet:

The user or the application has ordered sending of the data information to a number of designated addressees.

The network's normal action when receiving the packet:

The network copies the common component and type dependent component and dispatches the new packets to the designated addressees.

The terminal's normal action when receiving the packet:

The terminal only receives this packet as a returned packet.

Length of the packet

The length can vary between 34 and 545 octets.

Cantel Mobitex

Nr No	51/1056 - A 296 5171/2 Ue		
System Date 1990-02-19	Rev A	F. File MTS09A.2	

DATA with address list as generated by a terminal

MPAK COMMON COMPONENT:

octet 1-3: | sender |

octet 4-6: | addressee: MOBITEX network |

octet 7: | 0 | 0 | 0 | 0 | 0 | 1 | 0 | X |

octet 8: | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

ADDRESS LIST:

octet 9: | number of addresses |

octet 10-12: | addressee 1 |

octet 13-15: | addressee 2 |

octet 16-18: | addressee 3 |

octet 19-21: | addressee 4 |

octet 22-24: | addressee 5 |

octet 25-27: | addressee 6 |

octet 28-30: | addressee 7 |

TYPE DEPENDENT COMPONENT:

octet 31-33: | time |

octet 34 etc | data (max. 512 octets) |

(X = optional 0 or 1)

data: 1-512 complete octets.
            Optional coding.

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Cantel Mobitex ~	Nr Na 51/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-19	Rev A	F. Fot MTS09A.2

3.5   STATUS (status messages) without address list:

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

Terminal subscription, personal subscription or group.

Raised flags:

Optional: MAILBOX_F

Criteria for generating the packet:

The user or the application has ordered sending of the status information.

The network's normal action when receiving the packet:

The network dispatches the packet to the designated addressee.

The terminal's normal action when receiving the packet:

The information in the packet is stored, processed and/or presented to the user of the addressed subscription, according to reference R1-08.

Length of the packet

12 octets.

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STATUS without address list as generated by a terminal:

MPAK COMMON COMPONENT:

octet 1-3:   sender

octet 4-6:   addressee

octet 7:

0	0	0	0	0	0	0	X

octet 8:

0	0	0	0	0	0	1	1

TYPE DEPENDENT COMPONENT:

octet 9-11:   time

octet 12:   status code

(X = optional 0 or 1)

status code: 1 octet.
Optional coding. (0-255 decimal).

	Nr. No		
Cantel Mobitex	51/1056 - A 296 5171/2 Ue		
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3.6 STATUS (status message) with address list:

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

The network is stated in the ordinary address field.

The intended message receivers are stated in the address list. The address list contains subscription numbers, each of which can designate a terminal subscription, a personal subscription or a group. Compare with the ordinary address field in 'STATUS' without address list.

Raised flags:

Requirement: SENDLIST_F
Optional: MAILBOX_F

Criteria for generating the packet:

The user or the application has ordered sending of the status information to a number of designated addressees.

The network's normal action when receiving the packet:

The network copies the common component and type dependent component and dispatches the new packets to the designated addresses.

The terminal's normal action when receiving the packet:

The terminal only receives this packet as a returned packet.

Length of the packets:

34 octets.

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<u>STATUS with address list as generated by a terminal</u>

MPAK COMMON COMPONENT:

octet 1-3: | sender |

octet 4-6: | addressee: MOBITEX network |

octet 7: | 0 | 0 | 0 | 0 | 0 | 1 | 0 | X |

octet 8: | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |

ADDRESS LIST:

octet 9: | number of addresses |

octet 10-12: | addressee 1 |

octet 13-15: | addressee 2 |

octet 16-18: | addressee 3 |

octet 19-21: | addressee 4 |

octet 22-24: | addressee 5 |

octet 25-27: | addressee 6 |

octet 28-30: | addressee 7 |

TYPE DEPENDENT COMPONENT:

octet 31-33: | time |

octet 34: | status code |

(X = optional 0 or 1)

status code: 1 octet.
                Optional coding. (0-255 decimal).

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3.7 HPDATA (data message with higher protocol identification) without address list

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

Terminal subscription, personal subscription or group.

Raised flags:

Optional: MAILBOX_F

Criteria for generating the packet:

The user or the application has ordered sending of the hpdata information..

The network's normal action when receiving the packet

The network dispatches the packet to the designated addressee.

The terminal's normal action when receiving the packet:

The information in the packet is stored, processed and/or presented to the user of the addressed subscription, according to reference R1-08.

Length of the packet:

The length of the packet can vary between 13 to 524 octets.

Cantel Mobitex	N. N. 51/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-19	A	MTS09A.2

HPDATA without address list as generated by a terminal :

MPAK COMMON COMPONENT:

octet 1-3: | sender |

octet 4-6: | addressee |

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X |

octet 8: | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

TYPE DEPENDENT COMPONENT:

octet 9-11: | time |

octet 12: | protocol identification |

octet 13:etc | data (max 512 octets) |

(X = optional 0 or 1)

data   1-512 complete octets.
               Optional coding.

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3.8 HPDATA (data message with higher protocol identification) with address list

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

The network is stated in the ordinary address field.

The intended message receivers are stated in the address list. The address list contains subscription numbers, each of which can designate a terminal subscription, a personal subscription or a group. Compare with the ordinary address field in 'HPDATA' without address list.

Raised flags:

Requirement: SENDLIST_F
Optional: MAILBOX_F

Criteria for generating the packet:

The user or the application has ordered sending of the hpdata information to a number of designated addressees.

The network's normal action when receiving the packet

The network copies the common component and type dependent component, and dispatches the new packets to the designated addressees.

The terminal's normal action when receiving the packet:

The terminal only receives this packet as a returned packet.

Length of the packet:

The length of the packet can vary between 35 to 546 octets.

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A 292 5153-3

Cantel Mobitex	Nr No 51/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-19	Rev A	FL File MTS09A.2

<u>HPDATA with address list as generated by a terminal :</u>

MPAK COMMON COMPONENT:

octet 1-3: | sender |

octet 4-6: | addressee: MOBITEX network |

octet 7: | 0 0 0 0 0 1 0 X |

octet 8: | 0 0 0 0 0 1 0 0 |

ADDRESS LIST:

octet 9: | number of addresses |

octet 10-12: | addressee 1 |

octet 13-15: | addressee 2 |

octet 16-18: | addressee 3 |

octet 19-21: | addressee 4 |

octet 22-24: | addressee 5 |

octet 25-27: | addressee 6 |

octet 28-30: | addressee 7 |

TYPE DEPENDENT COMPONENT:

octet 31-33: | time |

octet 34: | protocol identification |

octet 35 etc | data (max 512 octets) |

(X = optional 0 or 1)

data   1-512 complete octets. Optional coding.

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3.9 EXTPAK (external packet):

Designated sender:

External network, terminal subscription or personal subscription.

Designated addressee:

Terminal subscription, personal subscription, group or external network.

Raised flags:

Requirement: EXTERN_F

Criteria for generating the packet:

The user or the application has ordered sending of information to or from external telecommuncations network.

The network's normal action when receiving the packet:

If the network receives EXTPAK from a subscriber in MOBITEX, the packet is dispatched to the designated external telecommunications network which then sends it to the designated subscription in this network.

If the network receives EXTPAK from an external telecommunications network, the packet is dispatched to the designated subscription in MOBITEX.

The terminal's normal action when receiving the packet:

The information in the packet is stored, processed and/or presented to the user of the addressed subscription, according to reference R1-08.

Length of the packet:

To be defined.

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A 292 5153-3

Cantel Mobitex™	Nr. Nr. 51/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-19	Rev A	Fil Fil MTS09A.2

EXTPAK as generated by a terminal

MPAK COMMON COMPONENT:

octet 1-3:

							sender						

octet 4-6:

	addressee: external network MAN

octet 7:

0	0	0	0	0	0	0	0

octet 8:

0	0	1	0	0	0	0	1

TYPE DEPENDENT COMPONENT:

octet 9-11:

			time						

octet 12 etc:

to be defined

to be defined

(X = optional 0 or 1)

The type dependent component has not yet been defined
because the external gateways are not yet fully specified.
The type dependent component will include a field
"external data", transparent to data for the external
network.

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Cantel Mobitex	Nr. ID. 51/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-19	Rev A	File MTS09A.2

4 PSOSCOM

This chapter describes all "packet switched emergency communication" packets.

4.1 SOS (emergency signal):

Designated sender:

Terminal subscription or personal subscription

Designated addressee:

The network.

Raised flags:

No raised flags.

Criteria for generating the packet:

The user or the application has ordered sending of the emergency signal.

The network's normal action when receiving the packet:

The network generates SOSINFO and sends this SOSINFO to the emergency receiver.

The terminal's normal action when receiving the packet:

The terminal does not normally receive SOS. However, in the case of autonomous operation the SOS can be returned to all terminals within a limited area. In this case the SOS packet is addressed to the All Terminals Group MAN.

The emergency information in the packet is stored, processed and presented to the user of the addressed subscription, according to reference R1-08.

Length of the packet:

The length can vary between 11 and 267 octets.

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SOS as generated by a terminal

MPAK COMMON COMPONENT:

octet 1-3:

sender

octet 4-6:

addressee: MOBITEX network

octet 7:

0	0	0	0	0	0	0	0

octet 8:

0	1	0	0	0	0	0	1

TYPE DEPENDENT COMPONENT:

octet 9-11:

time

octet 12 etc

dynamic emergency information

dynamic
emergency
information: 0-256 complete octets. Selection of
'MOBITEX text code' according to reference
R1-06.

Cantel Mobitex	Nr. Sn. 51/1056 - A 296 5171/2 Ue		
	Prim. Dte 1990-02-19	Rev A	Fil. Fr. MTS09A.2

4.2 SOSINFO (emergency message):

Designated sender:

Terminal subscription or personal subscription can be designated the sender.

The packet is always generated by the network however.

Designated addressee:

Terminal subscription or personal subscription.

Raised flags:

No raised flags.

Criteria for generating the packet:

The network has received SOS from the sender. The network supplements this with static emergency information stored in the network and creates a SOSINFO packet. The network send the SOSINFO to the addressee.

The network's normal action when receiving the packet:

The network does not normally receive SOSINFO.

The terminal's normal action when receiving the packet:

The information in the packet is stored, processed and/or presented to the user of the addressed subscription, according to reference R1-08.

Note that in the case of autonomous operation the SOSINFO can be returned to all terminals within a limited area. In this case the SOSINFO packet is addressed to the All Terminals group MAN.

Length of the packet:

The length can vary between 11 and 523 octets.

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Cantel Mobitex

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SOSINFO as generated by network

MPAK COMMON COMPONENT:

octet 1-3: | sender |

octet 4-6: | addressee |

octet 7: | 0 0 0 | 0 | 0 0 0 0 |

octet 8: | 0 1 | 0 | 0 0 0 1 0 |

TYPE DEPENDENT COMPONENT:

octet 9-11: | time |

octet 12 etc | static emergency information |

octet etc. | dynamic emergency information |

static emergency information:

    0-256 complete octets.
    Selection of 'MOBITEX text code' according to
    reference R1-06.

dynamic emergency information:

    0-256 complete octets.
    Selection of 'MOBITEX text code' according to
    reference R1-06.

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Cantel Mobitex™	51/1056 - A 296 5171/2 Ue		
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4.3   SOSACK (emergency acknowledgement):

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

Terminal subscription or personal subscription.

Raised flags:

No raised flags.

Criteria for generating the packet:

The terminal has received a SOSINFO. Only a manual acknowledgement of SOSINFO will initiate SOSACK. (See reference R1-08).

The network's normal action when receiving the packet

The network dispatches the packet to the designated addressee. Note that the network does not monitor that SOSINFO is followed by SOSACK. The use of SOSACK is optional to the application.

The terminal's normal action when receiving the packet:

The information in the packet is stored, processed and/or presented to the user of the addressed subscription, according to reference R1-08.

The length of the packet:

12 octets.

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	1990-02-19	A	MTS09A.2

SOSACK as generated by a terminal

MPAK COMMON COMPONENT:

octet 1-3:
			sender			

octet 4-6:
			addressee			

octet 7:
0	0	0	0	0	0	0	0

octet 8:
0	1	0	0	0	0	1	1

TYPE DEPENDENT COMPONENT:

octet 9-11:
			time			

octet 12:
emergency acknowledgement status

emergency acknowledgement status:
    1 octet.
    Optional coding (0-255 decimal) according to
    application.

Cantel Mobitex™	51/1056 - A 296 5171/2 Ue		
	1990-02-19	A	MTS09A.2

5 CSUBCOM

This chapter describes all "circuit switched subscriber and emergency communication" packets.

5.1 CONREQ (connection request):

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

Terminal subscription, personal subscription or group.

Raised flags:

Optional: DIGITAL_F

Criteria for generating the packet:

The user or the application has requested circuit switched connection.

The network's normal action when receiving the packet:

The network dispatches the packet to the designated addressee and a real time connection is established.

If the connection is approved and the terminal is prot_1 or prot_2B, the connection is established without sending CONGRA.

If the connection is approved and the terminal is prot_2A, a positive acknowledgement is sent in the form of CONGRA.

The terminal's normal action when receiving the packet

The terminal normally receives CONREQ when another subscription has requested a connection with one of the terminal's subscriptions.

Prot_1 and prot_2A terminals will then generate CONREA for connection to take place.

Prot_2B terminal will then generate LINSEL and CONREA for connection to take place.

The terminal can also receive a returned CONREQ when the request has been refused for any reason. The terminal then considers the connection as disconnected.

Length of the packet:
10 octets.

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CONREQ as generated by a terminal

MPAK COMMON COMPONENT

octet 1-3:

		sender		

octet 4-6:

		addressee		

octet 7:

0	0	0	0	0	0	X	0

octet 8:

1	0	0	0	0	0	0	1

TYPE DEPENDENT COMPONENT:

octet 9:

line number

octet 10:

connection identity

(X = optional 0 or 1)

Line_number when generating from a terminal

  prot_1 and prot_2A: line number = 0

  prot_2B   line number = actual line

The connection identity is selected cyclically by the terminal.

5.2 CONFAST (connection request fast):

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

Terminal subscription, personal subscription or group.

Raised flags:

Optional: DIGITAL_F

Criteria for generating the packet:

The user or the application has requested fast circuit switched connection.

The network's normal action when receiving the packet:

The network dispatches the packet to the designated addressee and a real time connection is established.

If the connection is approved and the terminal is prot_1 or prot_2B, the connection is established without sending CONGRA.

If the connection is approved and the terminal is prot_2A, a positive acknowledgement is sent in the form of CONGRA.

The terminal's normal action when receiving the packet

The terminal normally receives CONFAST when another subscription has requested a fast connection with one of the terminal's subscriptions.

For prot_1 and prot_2A terminals the connection takes place immediately.

prot_2B terminal will then generate LINSEL for connection to take place.

The terminal can also receive a returned CONFAST when the request has been refused for any reason. The terminal then considers the connection as disconnected.

Length of the packet:
10 octets.

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CONFAST as generated by a terminal

MPAK COMMON COMPONENT

octet 1-3:

	sender	

octet 4-6:

	addressee	

octet 7:

0	0	0	0	0	0	X	0

octet 8:

1	0	0	0	1	0	1	1

TYPE DEPENDENT COMPONENT:

octet 9:

line number

octet 10:

connection identity

(X = optional 0 or 1)

Line_number when generating from a terminal

  prot_1 and prot_2A: line number = 0

  prot_2B   line number = actual line

The connection identity is selected cyclically by the terminal.

5.3 SOSCONREQ (emergency connection request):

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

Terminal subscription or personal subscription.

Raised flags:

No raised flags.

Criteria for generating the packet:

The user or the application has requested emergency connection.

The network's normal action when receiving the packet:

The network dispatches the packet to the designated addressee and a real time connection is established.

If the emergency connection is approved and the terminal is prot_1 or prot_2B, the connection is established without sending CONGRA.

If the emergency connection is approved and the terminal is prot_2A, a positive acknowledgement is sent in the form of CONGRA.

The terminal's normal action when receiving the packet

The terminal normally receives SOSCONREQ when another subscription has requested a emergency connection with one of the terminal's subscriptions.

Prot_1 and prot_2A terminals will then generate CONREA for connection to take place.

Prot_2B terminal will then generate LINSEL and CONREA for connection to take place.

The terminal can also receive a returned SOSCONREQ when the request has been refused for any reason. The terminal then considers the connection as disconnected.

Length of the packet:
10 octets.

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SOSCONREQ as generated by a terminal

MPAK COMMON COMPONENT:

octet 1-3:

octet 4-6:

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	0	0	1	0	0	0	1

TYPE DEPENDENT COMPONENT:

octet 9:   line number

octet 10:   connection identity

(X = optional 0 or 1)

Line_number when generating from a terminal

  prot_1 and prot_2A: line number = 0

  prot_2B   line number = actual line

The connection identity is selected cyclically by the terminal.

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5.4   SOSCONFAST (emergency connection request fast):

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

Terminal subscription or personal subscription.

Raised flags:

No raised flags.

Criteria for generating the packet:

The user or the application has requested fast emergency connection.

The network's normal action when receiving the packet:

The network dispatches the packet to the designated addressee and a real time connection is established.

If the emergency connection is approved and the terminal is prot_1 or prot_2B, the connection is established without sending CONGRA.

If the emergency connection is approved and the terminal is prot_2A, a positive acknowledgement is sent in the form of CONGRA.

The terminal's normal action when receiving the packet

The terminal normally receives SOSCONFAST when another subscription has requested a fast emergency connection with one of the terminal's subscriptions.

For prot_1 and prot_2A terminals the connection takes place immediately.

Prot_2B terminal will then generate LINSEL for connection to take place.

The terminal can also receive a returned SOSCONFAST when the request has been refused for any reason. The terminal then considers the connection as disconnected.

Length of the packet:
10 octets.

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SOSCONFAST as generated by a terminal

MPAK COMMON COMPONENT:

octet 1-3:

	sender	

octet 4-6:

	addressee	

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	0	0	1	1	0	1	1

TYPE DEPENDENT COMPONENT:

octet 9:

line number

octet 10:

connection identity

(X = optional 0 or 1)

Line_number when generating from a terminal

prot_1 and prot_2A: line number = 0

prot_2B   line number = actual line

The connection identity is selected cyclically by the terminal.

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5.5 ADDCONREQ (additional connection request):

ADDCONREQ can be used to direct the connection to an extension connected to the receiving terminal, e.g. a PABX extension. In addition to the fields contained in CONREQ, ADDCONREQ has an additional field of 20 octets available to the application layers. This field can be used to direct the receiving terminal to take the proper action.

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

Terminal subscription or personal subscription.

Raised flags:

Optional: DIGITAL_F

Criteria for generating the packet:

The user or the application has requested additional connection.

The network's normal action when receiving the packet:

The network dispatches the packet to the designated addressee and a real time connection is established.

If the connection is approved and the terminal is prot_1 or prot_2B, the connection is established without sending CONGRA.

If the connection is approved and the terminal is prot_2A, a positive acknowledgement is sent in the form of CONGRA.

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The terminal's normal action when receiving the packet

The terminal normally receives ADDCONREQ when another subscription has requested additional connection with one of the terminal's subscriptions.

Prot_1 and prot_2A terminals will then generate CONREA for connection to take place.

Prot_2B terminal will then generate LINSEL and CONREA for connection to take place.

The terminal can also receive a returned ADDCONREQ when the request has been refused for any reason. The terminal then considers the connection as disconnected.

The field for additional information can be used without any limitations by the user.

Length of the packet:
30 octets.

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<u>ADDCONREQ as generated by a terminal</u>

MPAK COMMON COMPONENT:

octet 1-3:   sender

octet 4-6:   addressee

octet 7:

0	0	0	0	0	0	X	0

octet 8:

1	0	0	0	0	0	1	0

TYPE DEPENDENT COMPONENT:

octet 9:   line number

octet 10:   connection identity

octet 11-30:   additional information

(X = optional 0 or 1)

additional
information: 20 octets.
               Optional coding.

Line_number when generating from a terminal

   prot_1 and prot_2A: line number = 0

   prot_2B   line number = actual line

The connection identity is selected cyclically by the
terminal.

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5.6 ADDCONFAST (additional connection request fast):

ADDCONFAST can be used to direct the connection to an extension connected to the receiving terminal, e.g. a PABX extension. In addition to the fields contained in CONFAST, ADDCONFAST has an additional field of 20 octets available to the application layers. This field can be used to direct the receiving terminal to take the proper action.

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

Terminal subscription or personal subscription.

Raised flags:

Optional: DIGITAL_F

Criteria for generating the packet:

The user or the application has requested fast additional connection.

The network's normal action when receiving the packet:

The network dispatches the packet to the designated addressee and a real time connection is established.

If the connection is approved and the terminal is prot_1 or prot_2B, the connection is established without sending CONGRA.

If the connection is approved and the terminal is prot_2A, a positive acknowledgement is sent in the form of CONGRA.

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The terminal's normal action when receiving the packet

The terminal normally receives ADDCONFAST when another subscription has requested a fast additional connection with one of the terminal's subscriptions.

For prot_1 and prot_2A terminals the connection takes place immediately.

Prot_2B terminal will then generate LINSEL for connection to take place.

The terminal can also receive a returned ADDCONFAST when the request has been refused for any reason. The terminal then considers the connection as disconnected.

The field for additional information can be used free by the subscriber.

Length of the packet:
30 octets.

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ADDCONFAST as generated by a terminal

MPAK COMMON COMPONENT:

octet 1-3: [sender]

octet 4-6: [addressee]

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | X | 0 |

octet 8: | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |

TYPE DEPENDENT COMPONENT:

octet 9: [line number]

octet 10: [connection identity]

octet 11-30: [additional information]

(X = optional 0 or 1)

additional
information: 20 octets.
               Optional coding.

Line_number when generating from a terminal

  prot_1 and prot_2A: line number = 0

  prot_2B   line number = actual line

The connection identity is selected cyclically by the
terminal.

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5.7 CONGRA (line connection request approved):

Designated sender:

Terminal subscription, personal subscription, group or external network.

The packet is always generated by the network.

Designated addressee:

Fixed terminal subscription prot_2A or personal subscription logged-in to a fixed terminal prot_2A.

Raised flags:

No raised flags.

Criteria for generating the packet:

The network has received CONREQ, SOSCONREQ, EXTCONREQ, ADDCONREQ, CONFAST, SOSCONFAST or ADDCONFAST from a fixed terminal prot_2A and approved circuit switched connection from the terminal.

The network's normal action when receiving the packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

The terminal connects the circuit switched connection to the designated line.

Length of the packet:

10 octets.

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CONGRA as generated by the network:

MPAK COMMON COMPONENT:

octet 1-3:

┌─────────── sender ───────────┐

octet 4-6:

┌─────────── addressee ───────────┐

octet 7:

| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8:

| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |

TYPE DEPENDENT COMPONENT:

octet 9:

| line number |

octet 10:

| connection identity |

Note: The line number is stated by the network. The connection identity is the same as the connection identity for CONREQ, SOSCONREQ, EXTCONREQ, ADDCONREQ, CONFAST, SOSCONFAST or ADDCONFAST.

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5.8 LINSEL (line selected):

Designated sender:

Fixed terminal subscription prot_2B or personal subscription logged-in to a fixed terminal prot_2B.

Designated addressee:

Terminal subscription, personal subscription or external network.

Raised flags:

No raised flags.

Criteria for generating the packet:

The fixed terminal prot_2B or personal subscription logged-in to a fixed terminal prot_2B has received CONREQ, SOSCONREQ, EXTCONREQ, ADDCONREQ, CONFAST, SOSCONFAST or ADDCONFAST.

Note: If the connection sequence is started with CONREQ, ADDCONREQ, SOSCONREQ or EXTCONREQ both LINSEL and CONREA must be sent by prot_2B terminal.

The network's normal action when receiving the packet:

If the connection sequence is started with CONFAST, ADDCONFAST or SOSCONFAST the network connects the circuit switched connection to the designated line.

If the connection sequence is started with CONREQ, ADDCONREQ,EXTCONREQ or SOSCONFAST the network expects the terminal to send CONREA after LINSEL.

The terminal's normal action when receiving the packet:

Terminal does not normally receive the packet.

Length of the packet:

10 octets.

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LINSEL as generated by terminal:

MPAK COMMON COMPONENT:

octet 1-3:

									sender														

octet 4-6:

									addressee														

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	0	0	0	1	1	0	1

TYPE DEPENDENT COMPONENT:

octet 9:

line number

octet 10:

· connection identity

Note: Line number = selected line (The terminal
          selects line number)

The connection identity is the same as the
connection identity for CONREQ, SOSCONREQ,
EXTCONREQ, ADDCONREQ, CONFAST, SOSCONFAST or
ADDCONFAST.

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5.9 CONORD (line connection order during group call):

Designated sender:

Terminal subscription or personal subscription.

The packet is always generated by the network.

Designated addressee:

Group.

Raised flags:

No raised flags.

Criteria for generating the packet:

Another subscription has requested real time connection with the addressee which comprises a group.

The network's normal action when receiving the packet

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

The terminal connects the designated line (without acknowledgement with a data packet), i.e. CONREA and DISCON packets should not be sent by terminals which receive CONORD.

Note only mobile terminals receive CONORD.

Length of the packet

10 octets.

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<u>CONORD as generated by the network:</u>

MPAK COMMON COMPONENT:

octet 1-3: | sender |

octet 4-6: | addressee |

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8: | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

TYPE DEPENDENT COMPONENT:

octet 9: | line number |

octet 10: | connection identity |

Note: A group call can only be disconnected by the A party. This means, when a B party want to leave or disconnect a group call, the line should be considered as disconnected without sending DISCON.

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5.10 CONREA (ready for line connection):

Designated sender:

Terminal subscription or personal subscription.

· Designated addressee:

Terminal subscription, personal subscription or
external network.

Raised flags:

No raised flags.

Criteria for generating the packet:

The terminal has received CONREQ, ADDCONREQ, SOSCONREQ or
EXTCONREQ from another subscription and is ready to
connect the circuit switched connection (HOOK-OFF signal
has been received from application layer). CONREA should
not be sent when the terminal receives CONORD, CONFAST,
ADDCONFAST or SOSCONFAST.

The network's normal action when receiving the packet

The connection is considered established until DISCON is
generated by one of the parties or the network.

The terminal's normal action when receiving the packet:

The terminal does not normally receive the packet.

Length of the packet

10 octets.

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CONREA as generated by a terminal:

MPAK COMMON COMPONENT:

octet 1-3: `[            sender            ]`

octet 4-6: `[          addressee          ]`

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8: | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |

TYPE DEPENDENT COMPONENT:

octet 9: `[        line number        ]`

octet 10: `[    connection identity    ]`

Note: For prot_1 and prot_2A terminals the line number is
      the number that was entered in CONREQ (ADDCONREQ,
      SOSCONREQ or EXTCONREQ) by the network. For prot_2B
      terminals the line number is the number that was
      enterd in LINSEL by the terminal
      The connection identity is same as the CONREQ
      (ADDCONREQ, SOSCONREQ or EXTCONREQ) referred to.

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5.11 DISCON (disconnection):

Designated sender:

Terminal subscription, personal subscription, the
network or external network.

Designated addressee:

Terminal subscription, personal subscription, group or
external network.

Raised flags:

No raised flags.

Criteria for generating the packet:

The sender, the application or the network wishes to break
the real time connection. DISCON is used irrespective of
the type of connection.

Note: A connection established with CONORD, i.e. a group
      call, should not be disconnected by the B-party
      terminal. The terminal consider thus the line
      disconnected without sending DISCON.

The network's normal action when receiving the packet:

Prepares the disconnection.

The terminal's normal action when receiving the packet:

Breaks the connection.
If the designated connection is already broken, no action
is taken.

Length of the packet:

10 octets.

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DISCON as generated by a terminal or network:

MPAK COMMON COMPONENT:

octet 1-3:
```
|   |   |   | _ | _ | _ | _ |   |   |
         sender
```

octet 4-6:
```
|   |   |   | _ | _ | _ | _ |   |   |
         addressee
```

octet 7:
```
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
```

octet 8:
```
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
```

TYPE DEPENDENT COMPONENT:

octet 9:
```
| line number |
```

octet 10:
```
| connection identity |
```

Note   Line number:

    prot_1 terminal   line number = 0
    prot_2A or prot_2B   line number = actual line

    Also the connection identity is to be same as the
    connection identity for CONREQ (ADDCONREQ,
    SOSCONREQ, EXTCONREQ, CONFAST, ADDCONFAST or
    SOSCONFAST).

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5.12 EXTCONREQ (external connection request):

Designated sender:

Terminal subscription, personal subscription or
external network.

Designated addressee:

External network, terminal subscription, personal
subscription.

Raised flags:

Optional: DIGITAL_F

Criteria for generating the packet:

The user or the application has requested external
connection.

The network's normal action when receiving the packet:

The network dispatches the packet to the designated
addressee and a real time connection with the external
network is established.

If the connection is approved and the terminal is prot_1
or prot_2B, the connection is established without sending
CONGRA.

If the connection is approved and the terminal is prot_2A,
a positive acknowledgement is sent in the form of CONGRA.

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The terminal's normal action when receiving the packet:

The terminal normally receives EXTCONREQ when another subscription has requested an external connection with one of the terminal's subscriptions. If the A party's subscription number in the external network is known, this is stated in the designated field in the type-dependent component.

Prot_1 and prot_2A terminals will then generate CONREA for connection to take place.

Prot_2B terminal will then generate LINSEL and CONREA for connection to take place.

The terminal can also receive a returned EXTCONREQ when the request has been refused for any reason. The terminal then considers the connection as disconnected.

Length of the packet:

30 octets.

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EXTCONREQ as generated by a terminal

MPAK COMMON COMPONENT:

octet 1-3:

				sender				

octet 4-6:

				addressee				

octet 7:

0	0	0	0	0	0	X	0

octet 8:

1	0	1	0	0	0	1	0

TYPE DEPENDENT COMPONENT:

octet 9:

line number

octet 10:

connection identity

octet 11-30:

subscr. no. in external network

(X = optional 0 or 1)

Line_number when generating from a terminal

   prot_1 and prot_2A: line number = 0

   prot_2B   line number = actual line

The connection identity is selected cyclically by the terminal.

In cases where the packet is generated from the terminal, the addressee should be the external network's MAN. If the packet is received by a terminal, the sender is the external network's MAN.

subscr. no. in external network:

      The subscription number in the external network of the intended addressee (i.e. the B-party). The field size is 20 octets and the number is given right justified (leading spaces) according to 'MOBITEX text code'.

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Example:

The telephone number 031-90 300 is coded as 03190300 and
will be the following in 'MOBITEX text code':

```
          8  7  6  5  4  3  2  1

octet 1:  0  0  1  0  0  0  0  0   (space)

octet 2:  0  0  1  0  0  0  0  0   (space)

  .                  .
  .                  .
  .                  .

octet 11: 0  0  1  0  0  0  0  0   (space)

octet 12: 0  0  1  0  0  0  0  0   (space)

octet 13: 0  0  1  1  0  0  0  0   (0)

octet 14: 0  0  1  1  0  0  1  1   (3)

octet 15: 0  0  1  1  0  0  0  1   (1)

octet 16: 0  0  1  1  1  0  0  1   (9)

octet 17: 0  0  1  1  0  0  0  0   (0)

octet 18: 0  0  1  1  0  0  1  1   (3)

octet 19: 0  0  1  1  0  0  0  0   (0)

octet 20: 0  0  1  1  0  0  0  0   (0)
```

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5.13 CLOOPON (loop test start):

Designated sender:

The network.

Designated addressee:

Fixed terminal subscription.

Raised flags:

No raised flags.

Criteria for generating the packet:

The network wishes to loop test the designated line for real time connection.

The network's normal action when receiving the packet

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

The Tx and Rx wires, of the designated line, should be loop tested to be measured by the network. All other activity on the line is discontinued.

Length of the packet:

9 octets.

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CLOOPON as generated by the network:

MPAK COMMON COMPONENT:

octet 1-3: | sender: the MOBITEX network |

octet 4-6: | addressee |

octet 7: | 0 0 0 | 0 | 0 0 0 0 |

octet 8: | 1 0 | 0 | 0 0 1 1 1 |

TYPE DEPENDENT COMPONENT:

octet 9: | line number |

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5.14 CLOOPOFF (loop test end):

Designated sender:

The network.

Designated addressee:

Fixed terminal subscription.

Raised flags:

No raised flags.

Criteria for generating the packet:

The loop test on the line ends.

The network's normal action when receiving the packet

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

The terminal should break the designated loop test. The line activity is continued.

The length of the packet:

9 octets.

Bildkort

Reprod

A 292 5153-3

Exhibit 2, p. 262

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CLOOPOFF as generated by the network:

MPAK COMMON COMPONENT:

octet 1-3: sender: the MOBITEX network

octet 4-6: addressee

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	0	0	0	1	0	0	0

TYPE DEPENDENT COMPONENT:

octet 9: line number

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5.15 **LINEON** (opening of line connection):

Designated sender:

Fixed terminal subscription prot_2A

Designated addressee:

The network.

Raised flags:

No raised flags.

Criteria for generating the packet:

A fixed terminal wishes to open one of its lines intended
for real time connection.

The network's normal action when receiving the packet

The network opens the indicated line.

The terminal's normal action when receiving the packet:

The terminal does not normally receive the packet.

Length of the packet:

9 octets.

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LINEON as generated by a terminal:

MPAK COMMON COMPONENT:

octet 1-3:

| sender: fixed terminal |

octet 4-6:

| addressee: the MOBITEX network |

octet 7:

| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8:

| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |

TYPE DEPENDENT COMPONENT:

octet 9:

| line number |

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5.16   LINEOFF (barring of line connection):

Designated sender:

Fixed terminal subscription prot_2A

Designated addressee:

The network.

Raised flags:

No raised flags.

Criteria for generating the packet:

A fixed terminal wishes to bar one of its line intended for real time connection.

The network's normal action when receiving the packet

The network disables the indicated line.

The terminal's normal action when receiving the packet:

The terminal does not normally receive the packet.

Length of the packet:

9 octets.

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Reprod

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LINEOFF as generated by a terminal:

MPAK COMMON COMPONENT:

octet 1-3:

sender: fixed terminal	

octet 4-6:

addressee: the MOBITEX network

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	0	0	0	1	0	1	0

TYPE DEPENDENT COMPONENT:

octet 9:

line number

| **Cantel Mobitex** ~ | Nr Nr 51/1056 – A 296 5171/2 Ue | | |
| | Datum Date 1990-02-19 | Rev A | Fil File MTS09A.2 |

6 DTESERV

This chapter describes all Data Terminal Service communication packets.

6.1   LOGINREQ (login request):

Designated sender:

Terminal subscription.

Designated addressee:

The network.

Raised flags:

No raised flags.

Criteria for generating the packet:

A user or the application wishes to log-in a personal subscription to the terminal.

Note: LOGINREQ should only be sent if there is enough space for another subscriber in the FLEXLIST and/or the subscription is not already present.

The network's normal action when receiving the packet:

The network checks that the log-in can take place.

The terminal's normal action when receiving the packet:

The terminal does not normally receive the packet. However, if this would occur, it should be shown to the user that the log-in request has faild.

Length of the packet:

19 octets.

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LOGINREQ as generated by a terminal:

MPAK COMMON COMPONENT:

octet 1-3:

	sender	

octet 4-6:

addressee: the MOBITEX network

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	1	0	0	0	0	0	1

TYPE DEPENDENT COMPONENT:

octet 9-11:

personal subscription MAN

octet 12-19:

password

password:

8 octets.
Selection of 'MOBITEX text code' according to reference R1-06. Passwords shorter than 8 characters are filled with leading spaces.

Example: The password FANTOM:

```
        8   7   6   5   4   3   2   1
```

octet 1:

0	0	1	0	0	0	0	0

(space)

octet 2:

0	0	1	0	0	0	0	0

(space)

octet 3:

0	1	0	0	0	1	1	0

(F)

octet 4:

0	1	0	0	0	0	0	1

(A)

octet 5:

0	1	0	0	1	1	1	0

(N)

octet 6:

0	1	0	1	0	1	0	0

(T)

octet 7:

0	1	0	0	1	1	1	1

(O)

octet 8:

0	1	0	0	1	1	0	1

(M)

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6.2   LOGINGRA (login request granted):

Designated sender:

Network.

Designated addressee:

Terminal subscription.

Raised flags:

No raised flags.

Criteria for generating the packet:

The network approves the previously requested log-in (LOGINREQ).

The network's normal action when receiving the packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

The terminal stores the personal subscription MAN as one of the subscription numbers the terminal may/can receive packets to. When LOGINGRA is received, this should be sent to the application layer to be shown to the user.

Note: If the personal subscription is already logged-in, no further actions are taken.

Length of the packet:

11 octets.

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A 292 5153/3

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LOGINGRA as generated by the network:

MPAK COMMON COMPONENT:

octet 1-3:   sender: the MOBITEX network

octet 4-6:   addressee

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8: | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |

TYPE DEPENDENT COMPONENT:

octet 9-11:   Personal subscription MAN

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6.3 LOGINREF (login request refused):

Designated sender:

Network.

Designated addressee:

Terminal subscription.

Raised flags:

No raised flags.

Criteria for generating the packet:

The network does not permit the requested log-in.

The network's normal action when receiving the packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

The terminal notifies the user or the application that the log-in request has been refused by the network.

Length of the packet:

11 octets.

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LOGINREF as generated by the network:

MPAK COMMON COMPONENT:

octet 1-3:

sender: the MOBITEX network

octet 4-6:

addressee

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	1	0	0	0	0	1	1

TYPE DEPENDENT COMPONENT:

octet 9-11:

Personal subscription MAN

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6.4   LOGOUT (logout):

Designated sender:

Personal subscription.

Designated addressee:

The network.

Raised flags:

No raised flags.

Criteria for generating the packet:

A personal subscription wished to log-out from the terminal. The terminal should only send the packet if the subscription is in the FLEXLIST containing the personal subscriptions. After generating the packet, the personal subscription is deleted from the FLEXLIST.

The network's normal action when receiving the packet:

The network deletes the log-in. The subscription is 'at rest' until further notice.

The terminal's normal action when receiving the packet:

The terminal does not normally receive the packet.

Length of the packet:

11 octets.

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Reprod

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LOGOUT as generated by a terminal:

MPAK COMMON COMPONENT:

octet 1-3:

| | | | | | | | | | sender | | | | |

octet 4-6:

| | | | | addressee: the MOBITEX network |

octet 7:

| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8:

| 1 | ·1 | 0 | 0 | 0 | 1 | 0 | 0 |

TYPE DEPENDENT COMPONENT:

octet 9-11:

| | | | | MAN (terminal subscription) |

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6.5 LOGOUTORD (logout order):

Designated sender:

The network

Designated addressee:

Terminal subscription.

Raised flags:

No raised flags.

Criteria for generating the packet:

The personal subscription can only be logged-in to one terminal at a time. When a new log-in takes place and an old log-in is active (no LOGOUT has been sent), the network sends the LOGOUTORD packet to the old terminal in order to log-out the personal subscription from that terminal.

The network's normal action when receiving the packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

The terminal deletes the personal subscription from the list of logged-in subscriptions. It should also be shown to the user that the personal subscription has been logged-out.

Length of the packet:

11 octets.

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A 292 5153-3

<u>LOGOUTORD</u> as generated by the network:

MPAK COMMON COMPONENT:

octet 1-3:

				—	—	—	—			

sender: the MOBITEX network

octet 4-6:

addressee

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	1	0	0	0	1	0	1

TYPE DEPENDENT COMPONENT:

octet 9-11:

Personal subscription MAN

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6.6   BORN (terminal active for first time):

Designated sender:

Terminal subscription.

Designated addressee:

The network.

Raised flags:

No raised flags.

Criteria for generating the packet:

The terminal is active in MOBITEX for the first time or the terminal has lost important parts of its stored information, please see Main document, chapter "Parameters to be stored at power of".

If important parts, as stated above, is lost, BORN is replacing ROAM until a GROUPLIST is received. In this case the terminal should clear the list of personal subscriptions and the personal subscription must log-in again.

The network's normal action when receiving the packet:

The network sends the necessary information to the terminal (GROUPLIST).

The network also checks the terminal's Electronic Serial Number (ESN).

The terminal's normal action when receiving the packet:

The terminal does not normally receive the packet.

Length of the packet:

12 octets.

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BORN as generated by the terminal:

MPAK COMMON COMPONENT:

octet 1-3:

sender

octet 4-6:

addressee: the MOBITEX network

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	1	0	0	0	1	1	0

TYPE DEPENDENT COMPONENT:

octet 9 -12:

ESN

ESN   4 octets.
       This field states the electronic serial number.

       Fixed terminals without the ESN function should fill
       in the ESN field with zero's (0's).

       For the ESN specification, please refer to R1-06.

Cantel Mobitex™	51/1056 - A 296 5171/2 Ue		
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6.7   **ACTIVE (terminal active):**

Designated sender:

Terminal subscription.

Designated addressee:

The network.

Raised flags:

No raised flags.

Criteria for generating the packet:

Mobile terminal :

There are four different criteria for the network layer in the mobile terminal to send an ACTIVE packet :

1) At power-on or returning from manual radio mode.
2) The message buffer has space for at least 6 messages of maximum length.
3) Re-establishing contact with the network.
4) On order from the application layer

The transmission of the ACTIVE packet may be delayed a certain period of time (see reference R1-06).

Fixed terminal :

The fixed terminal sends the ACTIVE packet immediately after power-on or when the data link layer has restarted.

The network's normal action when receiving the packet:

The network updates the information about the terminal subscription. Messages stored in the mailbox, which are intended to the terminal and the subscriber, are sent to the subscribers.
The network checks the ESN.

The terminal's normal action when receiving the packet:

The terminal does not normally receive the packet.

Length of the packet:

12 octets.

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ACTIVE as generated by the terminal:

MPAK COMMON COMPONENT:

octet 1-3: sender

octet 4-6: addressee: the MOBITEX network

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8: | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |

TYPE DEPENDENT COMPONENT:

octet 9 -12: ESN

ESN   4 octets.
This field states the electronic serial number.

Fixed terminals without the ESN function should fill
in the ESN field with zero's (0's).

For the ESN specification, please refer to R1-06.

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6.8   <u>INACTIVE (terminal no longer active)</u>:

<u>Designated sender</u>:

Terminal subscription.

<u>Designated addressee</u>:

The network.

<u>Raised flags</u>:

No raised flags.

<u>Criteria for generating the packet</u>:

The user or the application wishes to inactivate the
terminal. INACTIVE is sent before the terminal is switched
off and before the mobile terminal enters manual radio
mode.

INACTIVE is also sent when the message buffer becomes
full.

<u>The network's normal action when receiving the packet</u>:

The network registers the terminal as inactive, and will
not send any message to the terminal until it is activated
again.

<u>The terminal's normal action when receiving the packet</u>:

The terminal does not normally receive the packet.

<u>Length of the packet</u>:

8 octets.

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INACTIVE as generated by the terminal:

MPAK COMMON COMPONENT:

octet 1-3:

			—	—	—	—			
			sender						

octet 4-6:

			—	—	—	—			
			addressee: the MOBITEX network						

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	1	0	0	1	0	0	0

TYPE DEPENDENT COMPONENT does not exist.

Cantel Mobitex ™	No. No. 51/1056 – A 296 5171/2 Ue		
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6.9   DIE (the terminal may not send packets):

Designated sender:

The network..

Designated addressee:

Terminal subscription.

Raised flags:

No raised flags.

Criteria for generating the packet:

The network generates this packet in order to prevent a terminal from send any user traffic to the network.

The network's normal action when receiving a packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

After the reception of DIE, the terminal must not send any user traffic (PSUBCOM, CSUBCOM, PSOSCOM). Only DTESERV packets are permitted until a LIVE packet has been received. It should also be shown to the user, that the terminal has received a DIE, and cannot send any user traffic.

Exceptions :
1)   A CSUBCOM 'speech request' received by the terminal should result in a DISCON sent to the network.

2)   The terminal may return packets to the network with the UNKNOWN_F raised.

Length of the packet:
8 octets.

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A 292 5153/3

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DIE as generated by the network

MPAK-COMMON COMPONENT:

octet 1-3: | sender: the MOBITEX network |

octet 4-6: | addressee |

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8: | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |

TYPE DEPENDENT COMPONENT does not exist.

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6.10 LIVE (the terminal may send packets again):

Designated sender:

The network.

Designated addressee:

Terminal subscription.

Raised flags:

No raised flags.

Criteria for generating the packet:

The terminal has previously received 'DIE' but is now permitted to send user traffic again.

The network's normal action when receiving the packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

The terminal may resume sending user traffic again.
It should also be shown to the user, that the terminal has received a LIVE, and can resume sending user traffic.

Length of the packet:

8 octets.

Bildkort

Reprod

A 292 51531 3

Cantel Mobitex ~	Nr. Nr. 51/1056 - A 296 5171/2 Ue		
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LIVE as generated by the network:

MPAK-COMMON COMPONENT:

octet 1-3:   sender: the MOBITEX network

octet 4-6:   addressee

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8: | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |

TYPE DEPENDENT COMPONENT does not exist.

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A 292 5153-3

6.11 ROAMORD (roaming order):

Designated sender:

The network.

Designated addressee:

The mobile terminal subscription or group.

Raised flags:

No raised flags.

Criteria for generating the packet:

The network orders the terminal to send 'ROAM'.

The network's normal action when receiving the packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

Sends 'ROAM'.

Length of the packet:

8 octets.

Bildkort

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ROAMORD as generated by the network:

MPAK-COMMON COMPONENT:

octet 1-3:   sender: the MOBITEX network

octet 4-6:   addressee

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8: | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 |

TYPE DEPENDENT COMPONENT does not exist.

Cantel Mobitex ~	Nr No 51/1056 - A 296 5171/2 Ue		
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6.12 ROAM (roaming message):

Designated sender: .

The mobile terminal subscription.

Designated addressee.

The network.

Raised flags:

No raised flags.

Criteria for generating the packet:

The terminal has decided to send 'ROAM' according to the
roaming algoritm procedure in the mobile terminal link
layer or the terminal has received ROAMORD from the
network.

The network's normal action when receiving the packet:

The network registers 'roaming' for the terminal.
The network also checks the ESN.

The terminal's normal action when receiving the packet:

The terminal does not normally receive the packet.

Length of the packet:
12 octets.

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ROAM as generated by the terminal:

MPAK-COMMON COMPONENT:

octet 1-3:

		sender		

octet 4-6:

addressee: the MOBITEX network

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	1	0	0	1	1	0	0

TYPE DEPENDENT COMPONENT:

octet 9 -12:

	ESN	

ESN   4 octets.
This field states the electronic serial number.

Fixed terminals without the ESN function should fill in the ESN field with zero's (0's).

For the ESN specification, please refer to R1-06.

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A 292 5153/3

6.13 VICESOSRX (re-direction of emergency messages):

Designated sender:

Terminal subscription or personal subscription.

Designated addressee:

The network.

Raised flags:

No raised flags.

Criteria for generating the packet:

The subscriber which is stated the emergency receiver wishes that emergency messages (SOSINFO) should be re-directed to the predestinated alternative emergency receiver.

The network's normal action when receiving the packet:

The network registers that emergency messages should be sent to the alternative emergency receiver.

The terminal's normal action when receiving the packet:

The terminal does not normally receive the packet. If the operation did not succeed, this should be shown to the user.

Length of the packet:

8 octets.

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VICESOSRX as generated by the terminal.

MPAK-COMMON COMPONENT:

octet 1-3:

	sender

octet 4-6:

addressee: the MOBITEX network

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	1	0	0	1	1	0	1

TYPE DEPENDENT COMPONENT does not exist.

A 292 31533

Cantel Mobitex ™	Nr No 51/1056 – A 296 5171/2 Ue		
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6.14 <u>SOSRX (cancel of emergency message re-direction):</u>

<u>Designated sender:</u>

Terminal subscription or personal subscription.

<u>Designated addressee:</u>

The network.

<u>Raised flags:</u>

No raised flags.

<u>Criteria for generating the packet:</u>

The subscriber which is the emergency receiver wishes to resume reception of emergency messages (SOSINFO).

<u>The network's normal action when receiving the packet:</u>

The network registers that emergency messages should be sent to the emergency receiver.

<u>The terminal's normal action when receiving the packet:</u>

The terminal does not normally receive the packet. If the operation did not succeed, this should be shown to the user.

<u>Length of the packet:</u>
8 octets.

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SOSRX as generated by the terminal:

MPAK-COMMON COMPONENT:

octet 1-3:

							sender							

octet 4-6:

			addressee: the MOBITEX network								

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	1	0	0	1	1	1	0

TYPE DEPENDENT COMPONENT does not exist.

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6.15 GROUPLIST (list of group MAN):

Designated sender:.

The network.

Designated addressee:

The terminal subscription.

Raised flags:

MAILBOX_F

This packet can be stored in the network's mailbox if the addressee cannot be reached even though MAILBOX is not included in the subscription service.

Criteria for generating the packet:

Changes in the subscriber information have taken place, the mobile terminal has sent 'BORN' or the fixed terminal is activated for the first time.

The network's normal action when receiving the packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

Replace former list of group numbers with this new group list.

Length of the packet:
54 octets.

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<u>GROUPLIST as generated by the network:</u>

MPAK-COMMON COMPONENT:

octet 1-3: | sender: the MOBITEX network |

octet 4-6: | addressee |

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X |

octet 8: | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |

X = '0' or '1'

TYPE DEPENDENT COMPONENT:

octet 9: | number of MAN |

octet 10-12: | MAN 1 (All Terminals Group) |

octet 13-15: | MAN 2 |

octet 16-18: | MAN 3 |

octet 19-21: | MAN 4 |

octet 22-24: | MAN 5 |

octet 25-27: | MAN 6 |

octet 28-30: | MAN 7 |

octet 31-33: | MAN 8 |

octet 34-36: | MAN 9 |

octet 37-39: | MAN 10 |

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octet 40-42: MAN 11

octet 43-45: MAN 12

octet 46-48: MAN 13

octet 49-51: MAN 14

octet 52-54: MAN 15

Note: MAN 1 (octets 10-12) are used for the All Terminals Group number.

Cantel Mobitex ~	N: Nu 51/1056 - A 296 5171/2 Ue		
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6.16 FLEXREQ (list of logged-in MAN requested):

Designated sender:

The network.

Designated addressee:

Terminal subscription.

Raised flags:

No rasied flags.

Criteria for generating the packet:

The network requires current information about which subscription that are logged-in at the terminal.

The network's normal action when receiving the packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

The terminal sends current information in the 'FLEXLIST' packet.

Length of the packet:
8 octets.

Bildkort

Reprod

A 292 5153:3

Cantel Mobitex⁻	Nr Nr. 51/1056 - A 296 5171/2 Ue		
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FLEXREQ as generated by the network:

MPAK-COMMON COMPONENT:

octet 1-3:   sender: the MOBITEX network

octet 4-6:   addressee

octet 7: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8: | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |

TYPE DEPENDENT COMPONENT does not exist.

Cantel Mobitex	51/1056 - A 296 5171/2 Ue		
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6.17 FLEXLIST (list of personal subscriptions logged-in at the terminal)

Designated sender:

The network or terminal subscription.

Designated addressee:

The terminal subscription or the network.

Raised flags:

No raised flags.

Criteria for generating the packet:

The network: Changes in information have occurred.

Terminal: The terminal has received 'FLEXREQ'.

The network's normal action when receiving the packet:

The network checks the list of personal subscriptions logged-in at the terminal.

The terminal's normal action when receiving the packet:

Replace former list of personal subscriptions with the new list.

Length of the packet:
30 octets.

Bildkort

Reprod

A 292 5133/3

Cantel Mobitex™	Nr. No 51/1056 – A 296 5171/2 Ue		
	Datum Date 1990-02-19	Rev A	Fi. Fil MTS09A.2

FLEXLIST as generated by terminal and network:

MPAK-COMMON COMPONENT:

octet 1-3:
```
| ___ ___ |  _ _ _ _  | ___ ___ |
|         sender         |
```

octet 4-6:
```
| ___ ___ |  _ _ _ _  | ___ ___ |
|       addressee        |
```

octet 7:
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

octet 8:
| 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |

TYPE DEPENDENT COMPONENT:

octet 9:
```
| number of MAN |
```

octet 10-12:
```
| MAN 1 |
```

octet 13-15:
```
| MAN 2 |
```

octet 16-18:
```
| MAN 3 |
```

octet 19-21:
```
| MAN 4 |
```

octet 22-24:
```
| MAN 5 |
```

octet 25-27:
```
| MAN 6 |
```

octet 28-30:
```
| MAN 7 |
```

No more than 7 subscriptions may be logged-in to one and the same terminal.

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Reprod

A 292 5153/3

Cantel Mobitex™	N- No 51/1056 - A 296 5171/2 Ue		
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6.18 INFOREQ (terminal information requested):

Designated sender:

The network.

Designated addressee:

Mobile terminal subscription.

Raised flags:

No flags raised.

Criteria for generating the packet:

The network requires updating on terminal information.

The network's normal action when receiving the packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet.

The terminal sends 'INFO'.

Length of the packet:
8 octets.

Bildkort

Reprod

A 292 51533

Cantel Mobitex	Nr N: 51/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-19	Rev A	F. Fut MTS09A.2

<u>INFOREQ as generated by the network:</u>

MPAK-COMMON COMPONENT:

octet 1-3: | sender: the MOBITEX network |

octet 4-6: | addressee |

octet 7: | 0 0 0 | 0 | 0 0 0 0 |

octet 8: | 1 1 0 | 1 | 0 0 1 0 |

TYPE DEPENDENT COMPONENT does not exist.

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Reproc

A 292 5153/3

Cantel Mobitex	Nr Nr 51/1056 – A 296 5171/2 Ue		
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6.19   INFO (terminal information):

Designated sender:

Mobile terminal subscription.

Designated addressee:

The network.

Raised flags:

No raised flags.

Criteria for generating the packet:

The terminal has received 'INFOREQ'.

The network's normal action when receiving the packet.

The network updates the register.

The terminal's normal action when receiving the packet:

The terminal does not normally receive the packet.

Length of the packet:

The length may vary between 44 and 46 octets.

Bildkort

Reprod

A 29Z 51533

Cantel Mobitex

Nr Nu: 51/1056 - A 296 5171/2 Ue	
Datum Date: 1990-02-19	Rev: A	Fil. Fil: MTS09A.2

INFO as generated by the terminal:

MPAK-COMMON COMPONENT:

octet 1-3: | sender |

octet 4-6: | addressee: the MOBITEX network |

octet 7: | 0 0 0 | 0 | 0 0 0 0 |

octet 8: | 1 1 | 0 | 1 0 0 1 1 |

TYPE DEPENDENT COMPONENT:

octet 9: | number of MAN (personal subs) |

octet 10-12: | MAN 1 (personal subs) |

octet 13-15: | MAN 2 (personal subs) |

octet 16-18: | MAN 3 (personal subs) |

octet 19-21: | MAN 4 (personal subs) |

octet 22-24: | MAN 5 (personal subs) |

octet 25-27: | MAN 6 (personal subs) |

octet 28-30: | MAN 7 (personal subs) |

octet 31-44: | technical information |

octet 45 etc. | channel class dep. information |

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Reprod

A 292 5153-3

Cantel Mobitex	Nr. Nn 51/1056 - A 296 5171/2 Ue		
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technical information :   14 octets.

This field states whether the mobile terminal is
equipped with technical media for generating and
presenting different traffic types. The field also
describes the characteristics of the radio station.
The information to be stated in this field must be
provided when opening the subscription.

```
             8   7   6   5   4   3   2   1
            ┌───┬───┬───┬───┬───┬───┬───┐
octet  1:   │ med:generate connection   │   (no=0,yes=1)
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐
octet  2:   │ med: receive connection   │   (no=0,yes=1)
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐
octet  3:   │ media: present text        │   (no=0,yes=1)
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐
octet  4:   │ partially active in MBX    │   (no=0)See NOTE
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐
octet  5:   │ radio:superv.sign. loop    │   (no=0)See NOTE
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐
octet  6:   │ radio: terminal type       │   (Terminal type=3)
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐   (duplex=1,
octet  7:   │ radio: working method      │    2-frequency
            └───┴───┴───┴───┴───┴───┴───┘    simplex=2)
            ┌───┬───┬───┬───┬───┬───┬───┐
octet  8:   │ radio: output power        │   (WATT)
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐
octet  9:   │ radio:rx/tx switch time    │   (ms)
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐
octet 10:   │ radio: FBI                 │   See NOTE
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐
octet 11:   │ radio: priority            │   (4 levels, 1-4)
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐
octet 12:   │ 0   0   0   0   0   0   0   0 │   (spare)
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐
octet 13:   │ 0   0   0   0   0   0   0   0 │   (spare)
            └───┴───┴───┴───┴───┴───┴───┘
            ┌───┬───┬───┬───┬───┬───┬───┐
octet 14:   │ radio: channel class       │   (channel class=
            └───┴───┴───┴───┴───┴───┴───┘        4 or 5)
```

NOTE: Octet 4-5 : Partially active terminals and speech
                  quality supervisory signal are not used.
      FBI (frequency band information, octet 10) is
      defined in reference R1-06.

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channel class dependent information: 0-2 octets.

    This field states which radio channels the relevant
mobile equipment can use. There are 2 possible
channel classes that may be used; channel class 4 or
5.

Channel class 4:
          Full band station with independent
channels for receiving and transmitting
channels.

          Channel class 4

          No channel class dependent information is
required.

Channel class 5:
          Full band station with fixed duplex
spacing. The duplex spacing is given as
the channel difference.

          Channel class 5:

octet 1-2: | Duplex spacing (channels) |

    All figures are binary coded into two octets. The
most significant bit is bit 8 in the first octet.
The least significant bit is bit 1 in the second
octet.

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Reprod .

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6.20 TIME (time information):

Designated sender:

The network.

Designated addressee:

The terminal subscription or group.

Raised flags:

No raised flags.

Criteria for generating the packet:

When traffic load permits, the network sends the network time information to the terminals.

The network's normal action when receiving the packet :

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

The time information packet from the network may only be used as a calender clock function in the terminal's application.

Length of the packet:
11 octets.

Bildkort

Raprod

A 292 5153-3

Cantel Mobitex	Nr. Nr 51/1056 – A 296 5171/2 Ue		
	Datum Date 1990-02-19	Rev A	Ft. File MTS09A.2

TIME as generated by the network:

MPAK-COMMON COMPONENT:

octet 1-3:   sender: the MOBITEX network

octet 4-6:   addressee

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	1	0	1	0	1	0	0

TYPE DEPENDENT COMPONENT:

octet 9-11:   time

6.21 AREALIST (area ID information)

Designated sender: .

The network.

Designated addressee:

The mobile terminal subscription.

Raised flags:

MAILBOX_F

This packet can be placed in the network mailbox if the
addressee cannot be reached even if MAILBOX is not
included in the subscription.

Criteria for generating the packet:

Changes in the subscriber information concerning the
operational areas have taken place or the mobile terminal
has sent 'BORN'.

The network's normal action when receiving the packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet:

The terminal should forward the area list information to
the data link layer.

Length of the packet:
17 octets.

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AREALIST as generated by the network:

MPAK-COMMON COMPONENT:

octet 1-3:   sender: the MOBITEX network

octet 4-6:   addressee

octet 7:   0 0 0 0 0 0 0 0

octet 8:   1 1 0 1 0 1 0 1

TYPE DEPENDENT COMPONENT:

octet 9-15:   63   Bitmap   0

octet 16:   Command (0-255)

Bitmap : Bitmap representing the area ID's.
The bitmap should be transfered to the data link layer.

    0 = not valid area ID.
    1 = valid area ID.

Command : Mobile performance in areas which are indicated as not valid in the bitmap. The command should also be transfered to the data link layer.

    0 = not valid area ID's must not be used by the terminal.

    1 = not valid area ID's may be used, but traffic may be charged a different fee.

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Reprod

A 292 5155-3

Cantel Mobitex ~	51/1056 - A 296 5171/2 Ue		
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6.22 ESNREQ (Electronic Serial Number requested)

Designated sender:

The network.

Designated addressee:

Mobile terminal subscription.

Raised flags:

No flags raised.

Criteria for generating the packet:

The network requests a check of the electronic serial number.

The network's normal action when receiving the packet:

The network does not normally receive the packet.

The terminal's normal action when receiving the packet.

The terminal sends 'ESNINFO'.

Length of the packet:
8 octets.

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Reprod

A 292 51333

Cantel Mobitex	Nr No 51/1056 – A 296 5171/2 Ue		
	Datum Date 1990-02-19	Rev A	Fil. File MTS09A.2

ESNREQ as generated by the network:

MPAK-COMMON COMPONENT:

octet 1-3: | sender: the MOBITEX network |

octet 4-6: | addressee |

octet 7:

0	0	0	0	0	0	0	0

octet 8:

1	1	0	1	0	1	1	0

TYPE DEPENDENT COMPONENT does not exist.

Cantel Mobitex⁻	Sr Vn 51/1056 – A 296 5171/2 Ue		
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6.23 <u>ESNINFO (electronic serial number information:)</u>

<u>Designated sender:</u>

Mobile terminal subscription.

<u>Designated addressee:</u>

The network.

<u>Raised flags:</u>

No raised flags.

<u>Criteria for generating the packet:</u>

The terminal has received 'ESNREQ'.

<u>The network's normal action when receiving the packet.</u>

The network checks the electronic serial number.

<u>The terminal's normal action when receiving the packet:</u>

The terminal does not normally receive the packet.

<u>Length of the packet:</u>

12 octets.

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Reprod

A 292 5153-3

Cantel Mobitex ~	Nr. No 51/1056 - A 296 5171/2 Ue		
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ESNINFO as generated by the terminal:

MPAK-COMMON COMPONENT:

octet 1-3: | sender |

octet 4-6: | addressee: the MOBITEX network |

octet 7: | 0 0 0 | 0 0 0 0 0 |

octet 8: | 1 1 0 | 1 0 1 1 1 |

TYPE DEPENDENT COMPONENT:

octet 9 -12: | ESN |

ESN   4 octets.
This field states the electronic serial number.
For the ESN specification, please refer to R1-06.

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Reprod

A 392 5153/3

Cantel Mobitex	Sr No 51/1056 - A 296 5171/2 Ue		
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7 MOBITEX TERMINAL SPECIFICATION REFERENCE LIST

This document includes a number of references, made to
other sections in the terminal specification. The list
below shows these references, together with the page(s)
they are made on. Please note that a section could be
referred to several times on the same page.

R1-06, 5, 12, 28, 30, 70, 80, 81, 82, 92, 108, 117
R1-08, 9, 13, 17, 21, 25, 27, 29, 31

Below are the reference designations listed.

Reference	Section
R1-01	Arrangement of the documents
R1-02	MOBITEX System description
R1-03	General description of terminals
R1-04	Terminology
R1-05	References
R1-06	Network operator information
R1-08	Application layer
R1-09	Network layer
R1-11	Interface requirements, fixed terminals
R1-12	Other requirements, fixed terminals
R1-16	Link layer, mobile terminals
R1-17	Physical layer, mobile terminals
R1-18	Radio equipment, mobile terminals
R1-19	Other interfaces, mobile terminals
R1-20	Other requirements, mobile terminals

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Reprod

A 292 5153-3

Cantel Mobitex ~

ABSTRACT

This document describes the dialogues between terminals and the MOBITEX network.

Combinations of dialogues are not considered in this document and instead, the relevant typical cases in communication to/from terminals are described.

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Cantel Mobitex	Nr Nr 52/1056 - A 296 5171/2 Ue		
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Reprod

A 202 5153 3

Exhibit 2, p. 319

Cantel Mobitex

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Cantel Mobitex	Nr No 52/1056 - A 296 5171/2 Ue	
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1 INTRODUCTION

The dialogues are divided into the following groups :

PSUBCOM - packet switched subscriber communication

- Internal traffic without address list (*)
- Internal traffic with address list (*)
- Internal traffic to groups (*)
- External traffic

* = TEXT, DATA, STATUS, HP-DATA

PSOSCOM - Packet switched emergency communication

- Emergency signal/emergency message (SOS, SOSINFO)
- Emergency acknoledgement (SOSACK)

CSUBCOM - Circuit switched communication

- Connection and emergency connection (*)
- External connection (*)
- Group connection (*)
- Additional connection (*)
- Line test (LINEON, LINEOFF)

* = CONREQ, ADDCONREQ, SOSCONREQ, EXTCONREQ,
    CONFAST, ADDCONFAST, SOSCONFAST, LINSEL

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Reprod

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Cantel Mobitex	Nr No 52/1056 - A 296 5171/2 Ue	
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DTESERV - Data terminal service communication

SUBSCRIPTION STATUS
- Log-in   (LOGINREQ, LOGINGRA, LOGINREF)
- Log-out   (LOGOUT, LOGOUTORD)

TERMINAL STATUS
- Activation   (ACTIVE)
- Inactivation   (INACTIVE)
- DIE / LIVE
- Roaming   (ROAM, ROAMORD)
- Re-direction of emergency receiver(VICESOSRX)
- Cancel of re-direction   (SOSRX)

TERMINAL INFORMATION
- Updating groups   (GROUPLIST)
- Updating area IDs   (AREALIST)
- Updating personal subscriptions (FLEXREQ,
                                   FLEXLIST)
- Technical information   (INFOREQ, INFO)
- Time information   (TIME)
- ESN request, ESN information   (ESNREQ, ESNINFO)

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Reprod

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Cantel Mobitex	Nr. No 52/1056 - A 296 5171/2 Ue		
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2   INTERNAL TRAFFIC WITHOUT ADDRESS LIST

The dialogues are identical for all packet switched
internal traffic without address list. The 'TEXT' packet
in the following dialogues can be replaced by 'DATA',
'HPDATA' or 'STATUS', without any changes in the dialogue.

The common factor for all dialogues in internal traffic is
that the original packet ('TEXT' 1) is generated by the A
party according to the criteria and with the structure
described in Appendix A. Reservations are stated for the
respective dialogues.

Dialogue 2.1:

B-party is active and can be reached by the network.

```
        A              NETWORK              B

        |     'TEXT' 1    |                 |
        |---------------->|                 |
        |                 |    'TEXT' 2     |
        |                 |---------------->|
        |                 |                 |
```
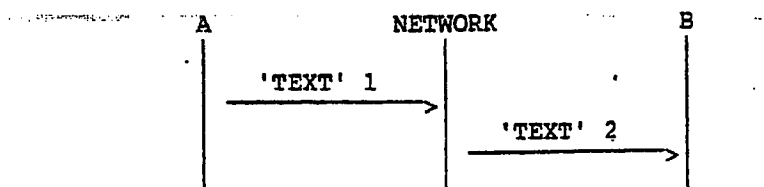
'TEXT' 2 is identical to 'TEXT' 1.

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Cantel Mobitex

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Dialogue 2.2:

'TEXT'1 has been generated with subscriber flag MAILBOX_F=0, which indicates that the packet should not be stored in the network mailbox.

The B-party is not available at the moment.

```
      A                   NETWORK              B
      │                      │                 │
      │       'TEXT' 1       │                 │
      │─────────────────────>│                 │
      │                      │                 │
      │       'TEXT' 2       │                 │
      │<─────────────────────│                 │
      │                      │                 │
```
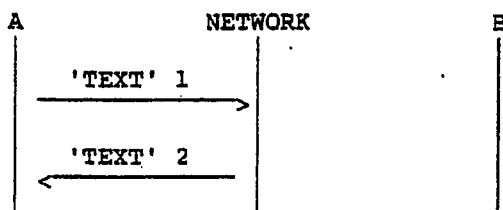
'TEXT' 2 is returned with traffic state = NO_TRANSFER
or
'TEXT' 2 is returned with traffic state = BUSY

NOTE : This dialogue occurs also when MAILBOX_F=1 and the packet cannot not be stored in the mailbox. A packet is not stored in the network mailbox if MAILBOX is not included in B-party's subscription service.

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Cantel Mobitex™	Nr No 52/1056 – A 296 5171/2 Ue		
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Dialogue 2.3:

'TEXT' 1 has subscriber flag MAILBOX_F=1; the packet may be stored in the mailbox.

The B party is not available at the moment.

```
        A              NETWORK              B
        |                  |                |
        |    'TEXT' 1      |                |
        |----------------->|                |
        |                  |                |
        |    'TEXT' 2      |                |
        |<-----------------|                |
        |                  |                |
```
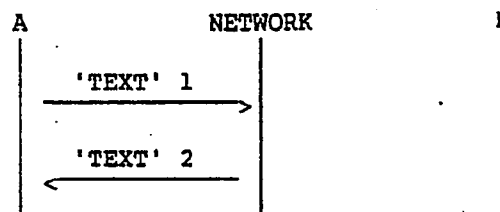
A copy of 'TEXT' 1 is stored in the network mailbox.
'TEXT' 2 has traffic state = IN_MAIL.

Packets that are stored in the mailbox are sent to the addressee in accordance with dialogue 15.2.

NOTE : If MAILBOX is required by the A-party but MAILBOX
       is not included in the B-party's subscription, the
       packet is returned in accordance with dialogue 2.2.

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A 292 3153/3

Cantel Mobitex ~	Nr No 52/1056 – A 296 5171/2 Ue		
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Dialogue 2.4:

The network has not switched the packet.
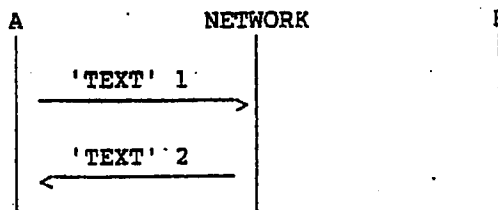
```
        A                 NETWORK              B
        |                     |                |
        |      'TEXT' 1       |                |
        |-------------------->|                |
        |                     |                |
        |      'TEXT' 2       |                |
        |<--------------------|                |
        |                     |                |
```

a) The reason why the transfer cannot be performed may be
   1) B party does not exist
   2) the transfer is not permitted due to the A party's
      subscription
   3) the transfer is not permitted due to the B party's
      subscription.

   'TEXT' 2 is then returned with traffic state = ILLEGAL

b) The network is overloaded.

   'TEXT' 2 is then returned with traffic state = CONGEST

c) A technical fault has occurred in the network. The
   packet cannot be switched.

   'TEXT' 2 is then returned with traffic state = ERROR

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Reprod

A 292 5153/3

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3 INTERNAL TRAFFIC WITH ADDRESS LIST

The dialogues are identical for all packet switched internal traffic with address list. The 'TEXT' packet in the following dialogues can thus be replaced by 'DATA', 'HPDATA' or 'STATUS' without any changes in the dialogue.

The common factor for all dialogue in internal traffic is that the the original packet ('TEXT' 1) is generated by the A-party according to the criteria and with the structure described in Appendix A. Reservations are stated for the respective dialogues.

The network immediately converts 'TEXT' 1 with address list to the number of packets stated in the address list. Each one of these packets are identical but with different addressee.

Dialogue 3.1:

```
        A              NETWORK              B1    B2    B3    B4
        |                 |                 |     |     |     |
        |    'TEXT' 1     |                 |     |     |     |
        |---------------->|   'TEXT' 2      |     |     |     |
        |                 |---------------->|     |     |     |
        |                 |   'TEXT' 3            |     |     |
        |                 |---------------------->|     |     |
        |                 |   'TEXT' 4                  |     |
        |                 |---------------------------->|     |
        |                 |   'TEXT' 5                        |
        |                 |---------------------------------->|
        |                 |      etc.        |     |     |     |
        |                 |                 |     |     |     |
```
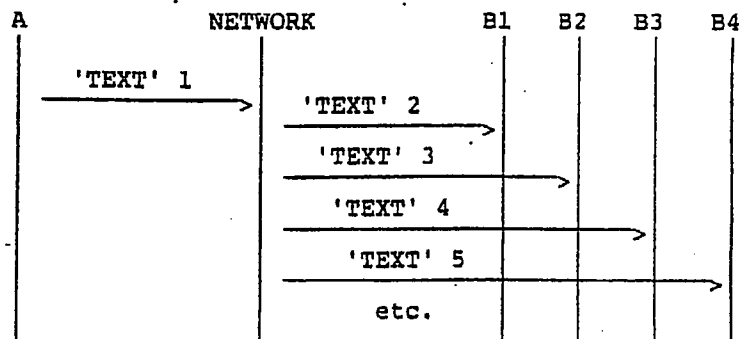
'TEXT'2 - 'TEXT'5 etc does not contain an address list.

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Dialogue 3.2:

'TEXT'1 contains an address list and has subscription flag
MAILBOX_F=0; the packet should not be stored in the
mailbox.

One or more of the B-parties (B1 and B3 in the example)
are currently not available.
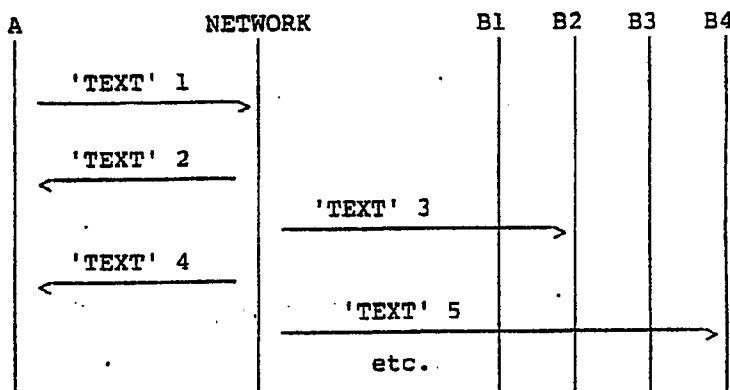
```
     A              NETWORK           B1    B2    B3    B4
     |                 |              |     |     |     |
     |    'TEXT' 1     |              |     |     |     |
     |---------------->|              |     |     |     |
     |                 |              |     |     |     |
     |    'TEXT' 2     |              |     |     |     |
     |<----------------|              |     |     |     |
     |                 |   'TEXT' 3   |     |     |     |
     |                 |------------------->|     |     |
     |    'TEXT' 4     |              |     |     |     |
     |<----------------|              |     |     |     |
     |                 |     'TEXT' 5 |     |     |     |
     |                 |-------------------------------->|
     |                 |      etc.    |     |     |     |
```

'TEXT'2 – 'TEXT'5 etc in the dialogue does not contain an
address list but have each been allocated an address from
the address list.

'TEXT' 2 and 'TEXT'4 has traffic state = NO_TRANSFER or
traffic state = BUSY.

NOTE : This dialogue occurs even if MAILBOX is required
       but the packet cannot not be stored in the mailbox.

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Dialogue 3.3:

'TEXT'1 contains an address list and has subscription flag
MAILBOX_F = 1.

One or more of the B parties (B2 and B4 in the example)
are currently not available.
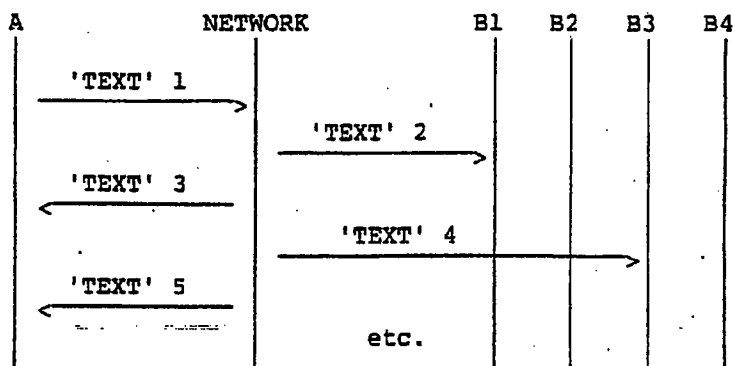
```
     A              NETWORK        B1    B2    B3    B4
     |                 |           |     |     |     |
     |   'TEXT' 1      |           |     |     |     |
     |---------------->|           |     |     |     |
     |                 |  'TEXT' 2 |     |     |     |
     |                 |---------------->|     |     |
     |   'TEXT' 3      |           |     |     |     |
     |<----------------|           |     |     |     |
     |                 |     'TEXT' 4    |     |     |
     |                 |---------------------------->|
     |   'TEXT' 5      |           |     |     |     |
     |<----------------|           |     |     |     |
     |                 |     etc.  |     |     |     |
     |                 |           |     |     |     |
```

'TEXT'2 - 'TEXT'5 etc in the dialogue does not contain an
address list but have each been allocated an address from
the address list.

Copies of the packet 'TEXT'3 and 'TEXT'5 are stored in the
network mailbox.

'TEXT' 3 and 'TEXT' 5 have traffic state = IN_MAIL.

NOTE: If MAILBOX is required by the A-party but the
       mailbox service is not included in the B-party's
       subscription, the packet is returned in the same way
       as in dialogue 3.2.

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Dialogue 3.4

The network has not switched the packet.

Case 1 :

```
         A              NETWORK            B
         |                 |               |
         |   'TEXT' 1      |               |
         |---------------->|               |
         |                 |               |
         |   'TEXT' 2      |               |
         |<----------------|               |
         |                 |               |
```
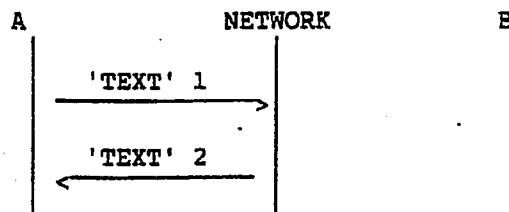
This dialogue shows that 'TEXT'2 is returned before the
packet was copied. 'TEXT'2 contains the adress list.

Case 2 :

```
         A              NETWORK            B
         |                 |               |
         |   'TEXT' 1      |               |
         |---------------->|               |
         |   'TEXT' 2      |               |
         |<----------------|               |
         |   'TEXT' 3      |               |
         |<----------------|               |
         |                 |               |
```
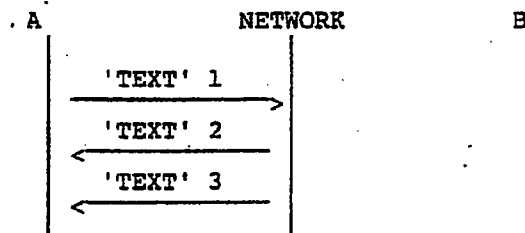
This dialogue shows that 'TEXT'2 and 'TEXT'3 is returned
after the original packet has been copied.
'TEXT'2 and 'TEXT'3 does not contain an addresslist.

a) The reason why the transfer cannot be performed may be
    1) B party does not exist
    2) the transfer is not permitted due to the A party's
       subscription
    3) the transfer is not permitted due to the B party's
       subscription.

'TEXT'2 (3) is then returned with traffic state = ILLEGAL.

b) The network is overloaded.

'TEXT'2 (3) is then returned with traffic state = CONGEST

c) A technical error has occured in the network.

'TEXT'2 (3) is then returned with traffic state = ERROR

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4 INTERNAL TRAFFIC TO GROUPS

The dialogues are identical for all packet switched internal traffic to groups. The 'TEXT' packets in the following dialogue can be replaced by 'DATA', 'HPDATA' or 'STATUS' without any changes in the dialogue common factor for all dialogue in internal traffic is that the original packet ('TEXT' 1) is generated by the A-party according to the criteria and with the structure shown in the Appendix A.

Since traffic to groups can affect a considerable number of subscriptions, the A-party is not notified if any of the B-parties is not available.

Dialogue 4.1

Packets to groups are routed to a limited number of predetermined base radio stations and fixed terminals.

```
    A                 NETWORK              BAS   B1    B2    B3
    |                    |                  |    |     |     |
    |     'TEXT' 1       |                  |    |     |     |
    |------------------->|                  |    |     |     |
    |                    |                  |    |     |     |
    |                    |    'TEXT' 2      |    |     |     |
    |                    |---------------->-|-->-|-->--|     |
    |                    |                  |    |     |     |
    |                    |    'TEXT' 3      |    |     |     |
    |                    |------------------|----|-----|-->--|
    |                    |                  |    |     |     |
```
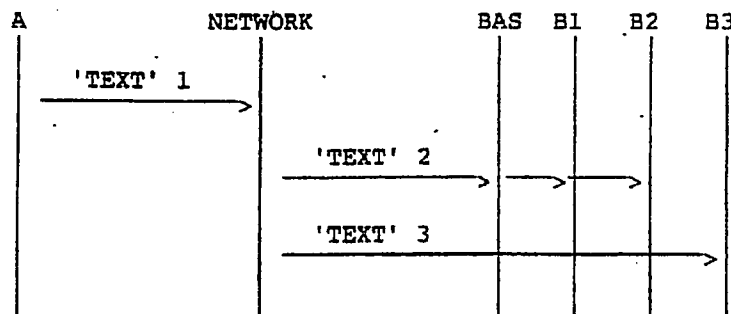
In this example, BASE is a predetermined base radio station. B1 and B2 are mobile terminals in the group which are operating under BASE. B3 is a fixed terminal in the group.

'TEXT' 2 and 3 are copies of 'TEXT' 1.

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A 292 5153:3

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Dialogue 4.2:

The network cannot transfer the packet.

```
        A              NETWORK            B
        │                 │               │
        │    'TEXT' 1     │               │
        │───────────────→ │               │
        │                 │               │
        │    'TEXT' 2     │               │
        │←─────────────── │               │
        │                 │               │
```
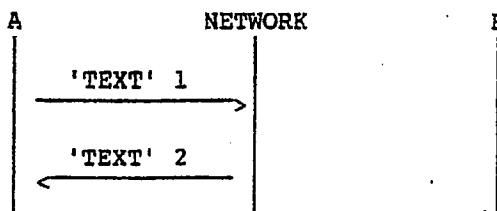
a) The reason why the transfer cannot take place may be
   that the transfer is not permitted in the A party's
   subscription or that the addressed group does not
   exist.

   'TEXT' 2 is returned with traffic state =   ILLEGAL.

b) The network is overloaded.

   'TEXT' 2 is returned with traffic state = CONGEST

c) A technical fault has occurred.

   'TEXT' 2 is returned with traffic state = ERROR

Sädkort

Reprod

A 392 51533

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5 EXTERNAL TRAFFIC

External traffic applies to traffic with different external telecommunications networks. Since the gateways to these networks are not yet fully specified, these dialogues are excluded.

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A 202 51530

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6 EMERGENCY SIGNAL/EMERGENCY MESSAGE

The 'SOS' packet is generated by the A-party according to the criteria and with the structure described in the Appendix A.

The 'SOSINFO' packet is generated by the network according to the criteria and with the structure according to Appendix A.

The B-party in these examples are the predestinated emergency receiver.

Dialogue 6.1:

The B-party is active and can be accessed by the network.

```
        A              NETWORK            B

              'SOS' 1
        |───────────────>|
                         |
                         |   'SOSINFO' 2
                         |───────────────>|
```
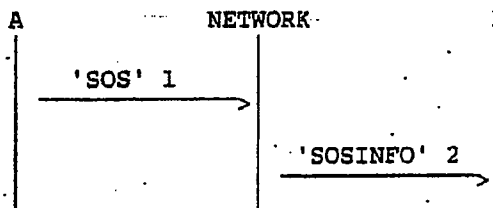
Dialogue 6.2:

If both the ordinary and the alternative emergency addresses are inactive, no normal transfer of the packet can be carried out. The emergency message SOSINFO will then be transmitted by the base station where the SOS entered the network as shown in dialogue 6.4.

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Dialogue 6.3:

The network has not been able to transfer the packet to
the emergency receiver.

```
       A              NETWORK              B
       |                 |                 |
       |    'SOS' 1       |                 |
       |---------------->|                 |
       |                 |                 |
       |    'SOS' 2       |                 |
       |<----------------|                 |
       |                 |                 |
```
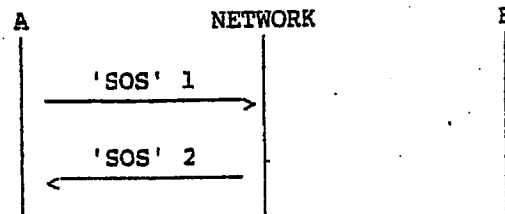
The packet contains incorrect information, for example
the information about the A party has been incorrectly
stated.

'SOS' 2 then has status = ILLEGAL

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Dialogue 6.4:

A technical fault has occured in the network.

The emergency signal (SOS) or the emergency message (SOSINFO) is re-transmitted by the base radio station where the emergency signal entered the network. The emergency signal or emergency message is addressed to the All Terminals Group MAN.

CASE 1

```
   A              BASE          mobiles
   |               |               |
   |   'SOS' 1     |               |
   |-------------->|               |
   |               |   'SOS' 2     |
   |               |-------------->|
   |               |               |
```
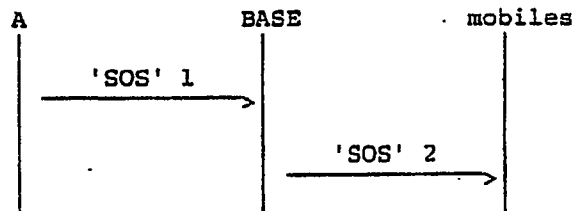
'SOS' 2 is re-transmitted with traffic state = OK. 'SOS'2 is addressed to All Terminals Group MAN.

CASE 2

```
   A             NETWORK         mobiles
   |               |               |
   |   'SOS' 1     |               |
   |-------------->|               |
   |               | 'SOSINFO' 2   |
   |               |-------------->|
   |               |               |
```
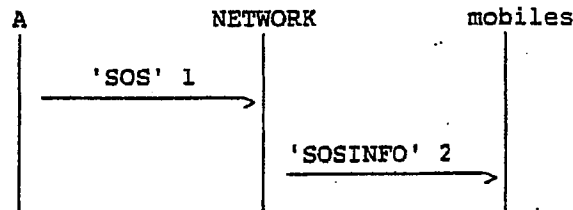
'SOSINFO' 2 is re-transmitted with traffic state = OK. 'SOSINFO'2 is addressed to the All Terminals Group MAN.

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7 EMERGENCY ACKNOWLEDGEMENT

The emergency acknowledge (SOSACK) is generated by the A
party according to the criteria and the structure given in
Appendix A.

<u>Dialogue 7.1:</u>

The B-party is active and can be reached by the network.

```
        A                  ·NETWORK              B
        |                     |                  |
        |    'SOSACK' 1       |                  |
        |-------------------->|                  |
        |                     |   'SOSACK' 2     |
        |                     |----------------->|
        |                     |                  |
```
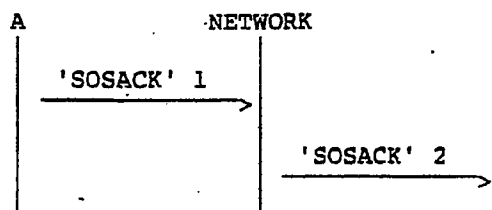
'SOSACK' 1 and 'SOSACK' 2 are identical.

<u>Dialogue 7.2:</u>

The B-party is can not be reached.

```
        A                  ·NETWORK              B
        |                     |                  |
        |    'SOSACK' 1       |                  |
        |-------------------->|                  |
        |    'SOSACK' 2       |                  |
        |<--------------------|                  |
        |                     |                  |
```
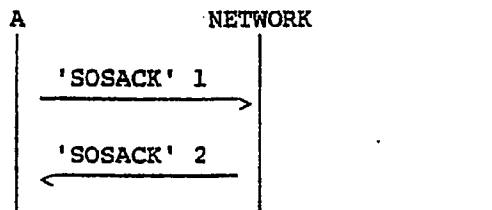
'SOSACK'2 is returned with traffic state = NO_TRANSFER

'SOSACK' cannot be stored in the network mailbox.

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Dialogue 7.3:

The network cannot transfer the packet.

```
    A              NETWORK              B
    |                 |                 |
    |  'SOSACK' 1     |                 |
    |---------------->|                 |
    |                 |                 |
    |  'SOSACK' 2     |                 |
    |<----------------|                 |
    |                 |                 |
```
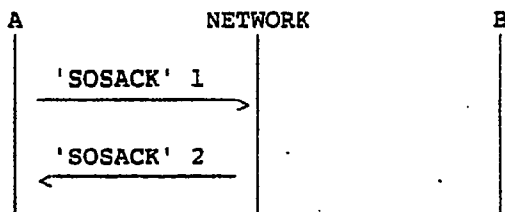
a) The reason why the transfer cannot take place could be
   that the B-party does not exist.

   'SOSACK' 2 is then returned with traffic state = ILLEGAL

b) The network is overloaded.

   'SOSACK' 2 is then returned with traffic state = CONGEST

c) A technical fault has occurred.

   'SOSACK' 2 is then returned with traffic state = ERROR

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A 592 5153/3

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8   CIRCUIT SWITCHED CONNECTION/EMERGENCY CONNECTION

In following chapters are CON**R equal to

CONREQ
ADDCONREQ
SOSCONREQ
EXTCONREQ

CON**F equal to

CONFAST
ADDCONFAST
SOSCONFAST

CON*** equal to

CONREQ
ADDCONREQ
SOSCONREQ
EXTCONREQ
CONFAST
ADDCONFAST
SOSCONFAST

NOTE 1: The terminal must not enter Speech Mode until

a) CON*** sent successfully

or

b) CON**R received and HOOK-OFF received from application layer and CONREA sent successfully

or

c) CON**F received and HOOK-OFF received from application layer

or

d) CONORD received and HOOK-OFF received from application layers.

NOTE 2: The Receive/Transmit switch of the mobile terminal operating in two-frequency simplex must not be operational until Speech Mode has been entered.

NOTE 3: HOOK-OFF without a previous request for a circuit switched connection shall result in an error alarm and CONREA shall not be sent to the network. HOOK-ON without a previous request for a circuit switched connection shall not result in a DISCON packet.

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NOTE 4: If there is no HOOK–OFF within 60 seconds from the receiving of CON**R, the connection shall be concluded by sending a DISCON.

If there is no HOOK–OFF within 60 seconds after the reception of CONORD, the terminal shall return to normal idle state <u>without</u> sending DISCON.

If there is no HOOK–OFF within 10 seconds from the receiving of CON**F, the connection shall be concluded by sending a DISCON.

NOTE 5: The network layer should send Speech-ON to the data link layer when

                a) CON*** sent successfully

or

                b) CON**R received and HOOK-OFF received from application layer and CONREA sent successfully

or

                c) CON**F received

or

                d) CONORD received.

NOTE 6: The terminal should leave Speech_Mode and send Speech-OFF to the data link layer when a DISCON is transmitted by the link layer or when a DISCON is returned by the link layer as 'not transmitted'.

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8.1 Ordinary circuit switched connection

Dialogue 8.1.1

A party: Prot_1
B party: Prot_1 or Prot_2A
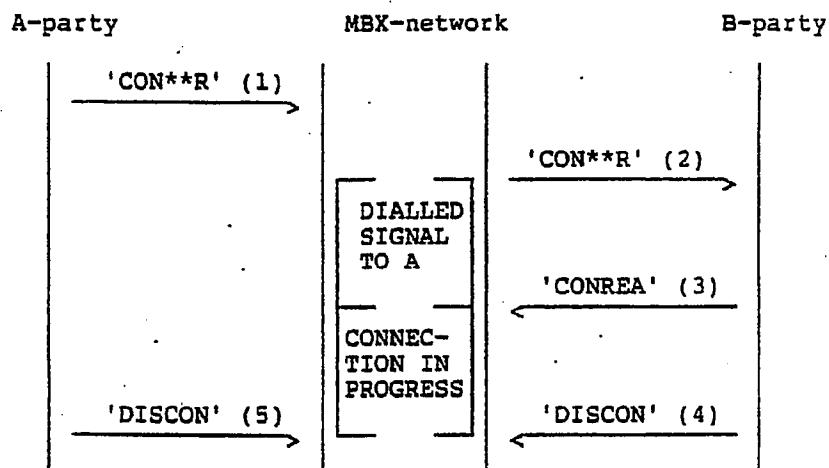
The B party is active and generate HOOK-OFF.

A-party   MBX-network   B-party

        'CON**R' (1)
        ──────────────►
                                        'CON**R' (2)
                                        ──────────────►
                            ┌──────────┐
                            │ DIALLED │
                            │ SIGNAL   │
                            │ TO A   │
                            │   │   'CONREA' (3)
                            │   │ ◄──────────────
                            ├──────────┤
                            │ CONNEC- │
                            │ TION IN │
        'DISCON' (5)   │ PROGRESS │   'DISCON' (4)
        ──────────────►   └──────────┘ ◄──────────────

COMMENT : The connection identity which the A party
          selects for CON**R (1) shall be included in all
          packets included in this connection (2-5).

Content of packets :

CON**R (1)   CON**R (2)

Sender: : A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   Z
Conn. I.D.   Y   Conn. I.D.   Y

CONREA (3)   DISCON (4)

Sender: B-PARTY   Sender: B-PARTY
Addressee: A-PARTY   Addressee: A-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   Z   Line no.:   Z
Conn. I.D.   Y   Conn. I.D.   Y

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DISCON (5)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

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Dialogue 8.1.2

A party: Prot_1
B party: Prot_2B
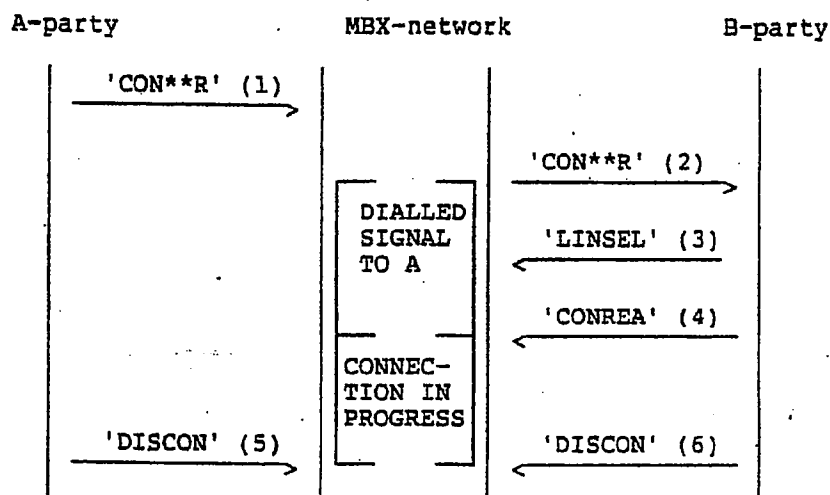
The B party is active and generate HOOK-OFF.

A-party   MBX-network   B-party

```
        'CON**R' (1)
    ───────────────────▶
                                        'CON**R' (2)
                          ┌─────────┐  ───────────────▶
                          │ DIALLED │
                          │ SIGNAL  │   'LINSEL' (3)
                          │ TO A    │  ◀───────────────
                          │         │
                          │         │   'CONREA' (4)
                          │         │  ◀───────────────
                          ├─────────┤
                          │ CONNEC- │
        'DISCON' (5)      │ TION IN │   'DISCON' (6)
    ───────────────────▶  │ PROGRESS│  ◀───────────────
                          └─────────┘
```

COMMENT : The connection identity which the A party
          selects for CON**R (1) shall be included in all
          relevant packets included in the connection (2-
          6).

Content of packets :

CON**R (1)   CON**R (2)

Sender: :   A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   dont care
Conn. I.D.   Y   Conn. I.D.   Y

LINSEL (3)   CONREA (4)

Sender: B-PARTY   Sender: B-PARTY
Addressee: A-PARTY   Addressee: A-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   Z   Line no.:   Z
Conn. I.D.   Y   Conn. I.D.   Y

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```
DISCON (5)                      DISCON (6)

Sender:       A-PARTY           Sender:       B-PARTY
Addressee:    B-PARTY           Addressee:    A-PARTY
Status:       OK                Status:       OK
DIGITAL_F:    0                 DIGITAL_F:    0
EXTERN_F:     0                 EXTERN_F:     0
Line no.:     0                 Line no.:     Z
Conn. I.D.    Y                 Conn. I.D.    Y
```

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Dialogue 8.1.3

A party: Prot_1
B party: Prot_1 or Prot_2A

The B party is active and generate HOOK-OFF.

A-party   MBX-network   B-party

'CON**F' (1) ──────────►

                                              'CON**F' (2) ──────────►

                          ┌─────────────┐
                          │ CONNEC-   │
                          │ TION IN   │
                          │ PROGRESS   │
'DISCON' (4) ─────────►   └─────────────┘   ◄────────── 'DISCON' (3)

COMMENT : The connection identity which the A party
          selects for CON**F (1) shall be included in all
          relevant packets included in the connection
          (2-4)

Content of packets:

CON**F (1)   CON**F (2)

Sender: :   A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   z
Conn. I.D.   Y   Conn. I.D.   Y

DISCON (3)   DISCON (4)

Sender: B-PARTY   Sender: A-PARTY
Addressee: A-PARTY   Addressee: B-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   z   Line no.:   0
Conn. I.D.   Y   Conn. I.D.   Y

Bridkort

Reprod

A 292 5153-3

Cantel Mobitex	Nr. No. 52/1056 – A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fil. File MTS09B.2

Dialogue 8.1.4

A party: Prot_1
B party: Prot_2B

The B party is active and generate HOOK-OFF.

```
 A-party              MBX-network              B-party

      |  'CON**F' (1)      |                     |
      |------------------->|                     |
      |                    |   'CON**F' (2)      |
      |                    |------------------->|
      |                    |   'LINSEL' (3)      |
      |                 +-------+<---------------|
      |                 |CONNEC-|                |
      |                 |TION IN|                |
      |  'DISCON' (4)   |PROGRESS| 'DISCON' (5) |
      |---------------->|       |<---------------|
```

COMMENT : The connection identity which the A party
          selects for CON**F (1) shall be included in all
          relevant packets included in the connection (2-
          5).

Content of packets:

CON**F (1)   CON**F (2)

Sender: : A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   dont care
Conn. I.D. Y   Conn. I.D. Y

LINSEL (3)   DISCON (4)

Sender: B-PARTY   Sender: A-PARTY
Addressee: A-PARTY   Addressee: B-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   Z   Line no.:   0
Conn. I.D. Y   Conn. I.D. Y

Cantel Mobitex⁻	Sr Nr 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	PC File MTS09B.2

```
DISCON (5)

Sender:      B-PARTY
Addressee:   A-PARTY
Status:      OK
DIGITAL_F:   0
EXTERN_F:    0
Line no.:    Z
Conn. I.D.   Y
```

Biidkort

Raproa

A 292 5153/3

Cantel Mobitex™	Nr. No 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	F. Fle MTS09B.2

8.2   B-party disconnects the call

<u>Dialogue 8.2.1</u>

A party: Prot_1
B party: Prot_1 or Prot_2A

The B party is active and generate HOOK-OFF. The B party disconnects with HOOK-ON.

A-party   MBX-network   B-party

        'CON**R' (1) ──────────►

                                        'CON**R' (2) ──────────►

                                 ┌──────────────┐
                                 │ DIALLED   │
                                 │ SIGNAL   │
                                 │ TO A   │
                                 │   │   ◄────── 'CONREA' (3)
                                 ├──────────────┤
                                 │ CONNEC-   │
                                 │ TION IN   │
                                 │ PROGRESS   │   ◄────── 'DISCON' (4)
                                 └──────────────┘

        ◄────── 'DISCON' (5)

CON**R (1)   CON**R (2)

Sender: A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   Z
Conn. I.D.   Y   Conn. I.D.   Y

CONREA (3)   DISCON (4)

Sender: B-PARTY   Sender: B-PARTY
Adressee: A-PARTY   Addressee: A-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   Z   Line no.:   Z
Conn. I.D.   Y   Conn. I.D.   Y

Cantel Mobitex ~	Nr Nu 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fil File MTS09B.2

DISCON (5)

```
Sender:     B-PARTY
Addressee:  A-PARTY
Status:     OK
DIGITAL_F:  0
EXTERN_F:   0
Line no.:   0
Conn. I.D.  Y
```

Bildkort

Reprod

A 292 51533

Cantel Mobitex ™	Nr No 52/1056 - A 296 5171/2 Ue		
	Datum-Date 1990-02-23	Rev A	Fi Fi MTS09B.2

Dialogue 8.2.2

A party: Prot_1
B party: Prot_2B

The B party is active and generate HOOK-OFF. The B-party
disconnects with HOOK-ON.

A-party   MBX-network   B-party

```
        'CON**R' (1)
   ──────────────────────▶
                                      'CON**R' (2)
                          ┌─────────┐ ──────────────────▶
                          │ DIALLED │
                          │ SIGNAL  │  'LINSEL' (3)
                          │ TO A    │ ◀──────────────────
                          │         │
                          │         │  'CONREA' (4)
                          │         │ ◀──────────────────
                          ├─────────┤
                          │CONNEC-  │
                          │TION IN  │
                          │PROGRESS │  'DISCON' (5)
                          │         │ ◀──────────────────
                          └─────────┘
        'DISCON' (6)
   ◀──────────────────
```

CON**R (1)   CON**R (2)

Sender: A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   dont care
Conn. I.D.   Y   Conn. I.D.   Y

LINSEL (3)   CONREA (4)

Sender: B-PARTY   Sender: B-PARTY
Adressee: A-PARTY   Adressee: A-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   Z   Line no.:   Z
Conn. I.D.   Y   Conn. I.D.   Y

Cantel Mobitex	Nr. No 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fil. File MTS09B.2

```
DISCON (5)                        DISCON (6)

Sender:        B-PARTY            Sender:        B-PARTY
Addressee:     A-PARTY            Addressee:     A-PARTY
Status:        OK                 Status:        OK
DIGITAL_F:     0                  DIGITAL_F:     0
EXTERN_F:      0                  EXTERN_F:      0
Line no.:      Z                  Line no.:      0
Conn. I.D.     Y                  Conn. I.D.     Y
```

Cantel Mobitex™	Nr Nn 52/1056 – A 296 5171/2 Ue		
	Darum Date 1990-02-23	Rev A	Fl. Fl.a MTS09B.2

Dialogue 8.2.3

A party: Prot_1
B party: Prot_1 or Prot_2A

The B party is active and generate HOOK-OFF. The B-party
disconnects the call with HOOK-ON.

```
    A-party                MBX-network                  B-party

          'CON**F' (1)
        ─────────────────►
                                              'CON**F' (2)
                            ┌──────────┐    ─────────────────►
                            │ CONNEC-  │
                            │ TION IN  │
                            │ PROGRESS │      'DISCON' (3)
                            └──────────┘    ◄─────────────────
          'DISCON' (4)
        ◄─────────────────
```

CON**F (1)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

CON**F (2)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	z
Conn. I.D.	Y

DISCON (3)

Sender:	B-PARTY
Addressee:	A-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	z
Conn. I.D.	Y

DISCON (4)

Sender:	B-PARTY
Addressee:	A-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

Cantel Mobitex

Dialogue 8.2.4

A party: Prot_1
B party: Prot_2B

The B party is active and generate HOOK-OFF. The B-party
disconnects the call with HOOK-ON.

```
A-party              MBX-network              B-party

        'CON**F' (1)
      ──────────────────►
                                  'CON**F' (2)
                              ──────────────────►
                                  'LINSEL' (3)
                              ◄──────────────────
                  ┌──────────┐
                  │ CONNEC-  │
                  │ TION IN  │
                  │ PROGRESS │   'DISCON' (4)
                  └──────────┘◄──────────────────
        'DISCON' (5)
      ◄──────────────────
```

CON**F (1)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

CON**F (2)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	dont care
Conn. I.D.	Y

LINSEL (3)

Sender:	B-PARTY
Adressee:	A-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

DISCON (4)

Sender:	B-PARTY
Addressee:	A-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

Cantel Mobitex™	Nr. No. 52/1056 - A 296 5171/2 Ue	
	Datum · Date 1990-02-23	Rev A	En. For MTS09B.2

```
DISCON (5)

Sender:      B-PARTY
Addressee:   A-PARTY
Status:      OK
DIGITAL_F:   0
EXTERN_F:    0
Line no.:    0
Conn. I.D.   Y
```

Cantel Mobitex™	Nr No 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fil File MTS09B.2

8.3   A-party disconnects the call.

Dialogue 8.3.1

A party: Prot_1
B party: Prot_1 or Prot_2A

The B party is active and generate HOOK-OFF. The A-party disconnects the call with HOOK-ON.

A-party	MBX-network	B-party

'CON**R' (1)

'CON**R' (2)

DIALLED
SIGNAL
TO A

'CONREA' (3)

CONNEC-
TION IN
PROGRESS

'DISCON' (4)

'DISCON' (5)

CON**R (1)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

CON**R (2)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

CONREA (3)

Sender:	B-PARTY
Addressee:	A-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

DISCON (4)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

Bildkort

Reprod

A 292 51 53/3

Cantel Mobitex ~

Nr Nr	52/1056 – A 296 5171/2 Ue		
Datum · Date	1990-02-23	Rev A	Fi. Fu MTS09B.2

```
DISCON (5)

Sender:     A-PARTY
Addressee:  B-PARTY
Status:     OK
DIGITAL_F:  0
EXTERN_F:   0
Line no.:   Z
Conn. I.D.  Y
```

Bildkort

Reproa

A 292 5153G

Cantel Mobitex

Dialogue 8.3.2

A party: Prot_1
B party: Prot_2B

The B party is active and generate HOOK-OFF. The A-party
disconnects the call with HOOK-ON.

```
A-party                MBX-network              B-party

       'CON**R' (1)
     ─────────────────►

                                    'CON**R' (2)
                              ──────────────────────►
                   ┌─────────┐
                   │ DIALLED │    'LINSEL' (3)
                   │ SIGNAL  │◄─────────────────────
                   │ TO A    │
                   │         │    'CONREA' (4)
                   │         │◄─────────────────────
                   ├─────────┤
                   │ CONNEC- │
                   │ TION IN │
                   │ PROGRESS│
       'DISCON' (5)│         │
     ─────────────►└─────────┘

                                    'DISCON' (6)
                              ──────────────────────►
```

CON**R (1)		CON**R (2)	
Sender:	A-PARTY	Sender:	A-PARTY
Addressee:	B-PARTY	Addressee:	B-PARTY
Status:	OK	Status:	OK
DIGITAL_F:	0	DIGITAL_F:	0
EXTERN_F:	0	EXTERN_F:	0
Line no.:	0	Line no.:	dont care
Conn. I.D.	Y	Conn. I.D.	Y

LINSEL (3)		CONREA (4)	
Sender:	B-PARTY	Sender:	B-PARTY
Addressee:	A-PARTY	Addressee:	A-PARTY
Status:	OK	Status:	OK
DIGITAL_F:	0	DIGITAL_F:	0
EXTERN_F:	0	EXTERN_F:	0
Line no.:	Z	Line no.:	Z
Conn. I.D.	Y	Conn. I.D.	Y

Cantel Mobitex -	Nr. No 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fl. File MTS09B.2

```
DISCON (5)                        DISCON (6)

Sender:     A-PARTY               Sender:     A-PARTY
Addressee:  B-PARTY               Addressee:  B-PARTY

Status:     OK                    Status:     OK
DIGITAL_F:  0                     DIGITAL_F:  0
EXTERN_F:   0                     EXTERN_F:   0
Line no.:   0                     Line no.:   Z
Conn. I.D.  Y                     Conn. I.D.  Y
```

Bildxort

Regna

A 292 5153/3

Cantel Mobitex™

Nr No		
52/1056 – A 296 5171/2 Ue		
Datum Date	Rev	F.. Fila
1990-02-23	A	MTS09B.2

Dialogue 8.3.3

A party: Prot_1
B party: Prot_1 or Prot_2A

The B party is active and generate HOOK-OFF. The A-party
disconnects the call with HOOK-ON.

A-party   MBX-network   B-party

        'CON**F' (1)

                                        'CON**F' (2)

                        ┌─────────┐
                        │CONNEC- │
                        │TION IN │
                        │PROGRESS │
        'DISCON' (3)   └─────────┘

                                        'DISCON' (4)

CON**F (1)   CON**F (2)

Sender: A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   z
Conn. I.D.   Y   Conn. I.D.   Y

DISCON (3)   DISCON (4)

Sender: A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   z
Conn. I.D.   Y   Conn. I.D.   Y

A 292 5153-3

Cantel Mobitex™	Nr Nr 52/1056 – A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fil File MTS09B.2

Dialogue 8.3.4

A party: Prot_1
B party: Prot_2B

The B party is active and generate HOOK-OFF. The A-party
disconnects the call with HOOK-ON.

```
A-party              MBX-network              B-party

       'CON**F' (1)
  |─────────────────────►|
                                   'CON**F' (2)
                           |─────────────────────►|
                                   'LINSEL' (3)
                           |◄─────────────────────|
                  ┌───────┐
                  │CONNEC-│
                  │TION IN│
                  │PROGRESS│
       'DISCON' (4)│       │
  |─────────────────────►│       │
                  └───────┘
                                   'DISCON' (5)
                           |─────────────────────►|
```

CON**F (1)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

CON**F (2)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	dont care
Conn. I.D.	Y

LINSEL (3)

Sender:	B-PARTY
Addressee:	A-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

DISCON (4)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

Cantel Mobitex	Nr No 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fil File MTS09B.2

DISCON (5)

```
Sender:      A-PARTY
Addressee:   B-PARTY
Status:      OK
DIGITAL_F:   0
EXTERN_F:    0
Line no.:    Z
Conn. I.D.   Y
```

Bildkort
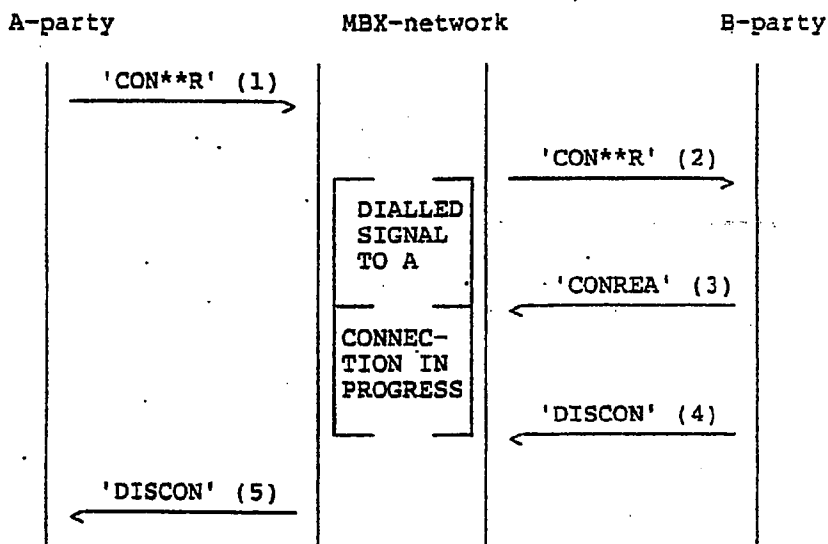
Reprod

A 292 5153/3

Cantel Mobitex	Nr. No. 52/1056 – A 296 5171/2 Ue	
	Datum Date 1990-02-23	Rev A	Fil. File MTS09B.2

8.4 The network disconnects the call.

The network disconnects a call only in exceptional cases. This occurs after a 'hurry up' tone during high traffic loading and in the case of faults.

A party: Prot_1
B party: Prot_1 or Prot_2A

The B party is active and answers.

The real time connection is connected between the parties. Neither of the parties has requested for a disconnection.

```
A-party                  MBX-network                 B-party

        'CON**R' (1)
    ─────────────────►
                                        'CON**R' (2)
                                     ─────────────────►
                         ┌─────────┐
                         │ DIALLED │
                         │ SIGNAL  │
                         │ TO A    │
                         │         │          'CONREA' (3)
                         │         │       ◄─────────────────
                         ├─────────┤
                         │ CONNEC- │
                         │ TION IN │
        'DISCON' (5)     │ PROGRESS│          'DISCON' (4)
    ◄─────────────────   └─────────┘       ─────────────────►
```

CON**R (1)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

CON**R (2)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

CONREA (3)

Sender:	B-PARTY
Addressee:	A-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

DISCON (4)

Sender:	MBX
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

Cantel Mobitex	Nr. No. 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fl. Fl.e MTS09B.2

```
DISCON (5)

Sender:        MBX
Addressee:     A-PARTY
Status:        OK
DIGITAL_F:     0
EXTERN_F:      0
Line no.:      0
Conn. I.D.     Y
```
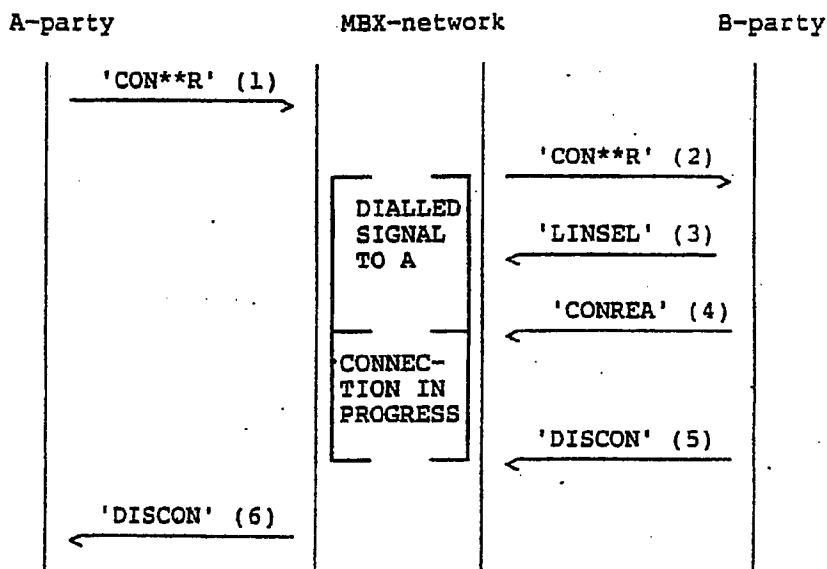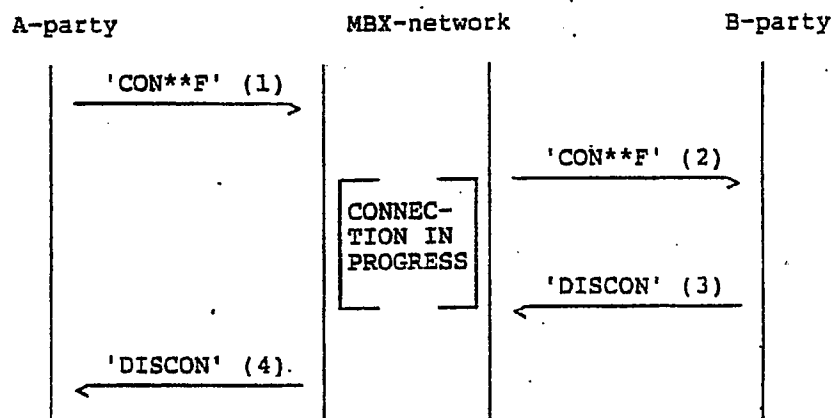
Bildkort

Reprod

A 292 5153/3

Cantel Mobitex	Nr No 52/1056 - A 296 5171/2 Ue		
	Datum · Data 1990-02-23	Rev A	Fu Fu MTS09B.2

8.5   B-party does not reply.

<u>Dialogue 8.5.1</u>

A party: Prot_1
B party: Prot_1 or Prot_2A

B-party is active but does not generate HOOK-OFF.
A-party generates HOOK-ON.

A-party   MBX-network   B-party
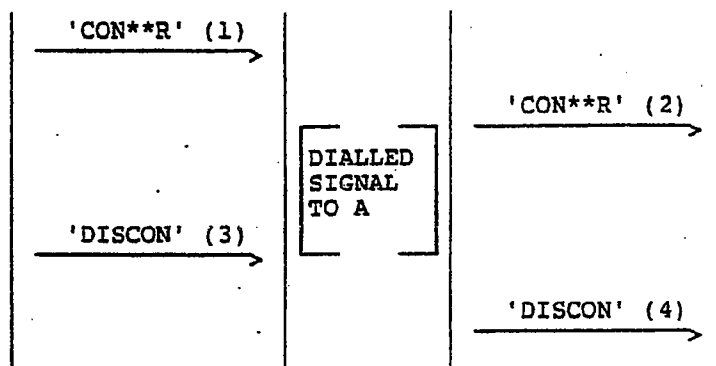
'CON**R' (1)

'CON**R' (2)

DIALLED
SIGNAL
TO A

'DISCON' (3)

'DISCON' (4)

CON**R (1)   CON**R (2)

Sender: A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   Z
Conn. I.D.   Y   Conn. I.D.   Y

DISCON (3)   DISCON (4)

Sender: A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B_PARTY
Status: OK   Status: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   line no.:   Z
Conn. I.D.   Y   Conn. I.D.   Y

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Reproa

A 292 5153-3

Cantel Mobitex

Dialogue 8.5.2

A party: Prot_1
B party: Prot_1 or Prot_2A

The B-party is active but does not reply.

The A party does not generate HOOK-ON (A party does not disconnect the call).
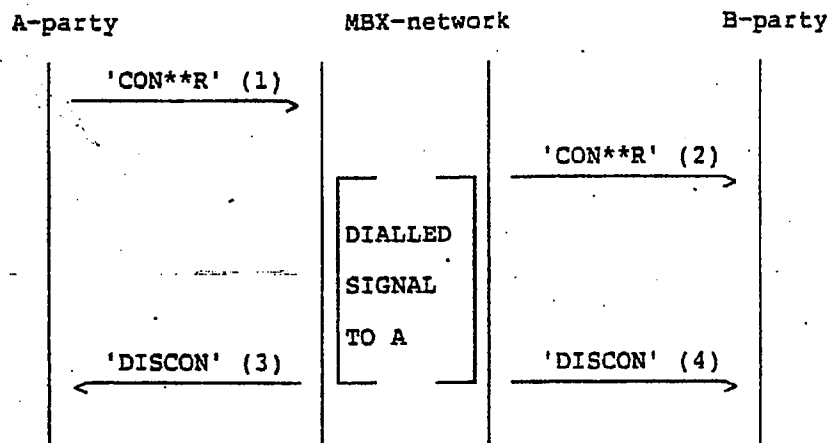
A-party	MBX-network	B-party

```
A-party                MBX-network                 B-party
  |                         |                          |
  |  'CON**R' (1)           |                          |
  |------------------------>|                          |
  |                         |   'CON**R' (2)           |
  |                    +----+----+------------------->|
  |                    | DIALLED |                     |
  |                    | SIGNAL  |                     |
  |                    | TO A    |                     |
  |  'DISCON' (3)      |         |   'DISCON' (4)      |
  |<-------------------+----+----+------------------->|
  |                         |                          |
```

CON**R (1)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

CON**R (2)

Sender:	A-PARTY
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	z
Conn. I.D.	Y

DISCON (3)

Sender:	MBX
Addressee:	A-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

DISCON (4)

Sender:	MBX
Addressee:	B-PARTY
Status:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	z
Conn. I.D.	Y

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Cantel Mobitex	N. No 52/1056 - A 296 5171/2 Ue		
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8.6 A-party with several line connections

Dialogue 8.6.1

A party: Prot_2A
B party: Prot_1 or Prot_2A

The B party is active and generates HOOK-OFF.

```
A-party              MBX-network            B-party

         'CON**R' (1)
      ┌──────────────────►

         'CONGRA' (2)
      ◄──────────────────

                                  'CON**R' (3)
                              ┌──────────────────►
                         ┌───────────┐
                         │ DIALLED   │
                         │ SIGNAL    │
                         │ TO A      │
                         │           │  'CONREA' (4)
                         │           │◄──────────────────
                         ├───────────┤
                         │ CONNEC-   │
                         │ TION IN   │
         'DISCON' (6)    │ PROGRESS  │  'DISCON' (5)
      ┌──────────────────│           │◄──────────────────
                         └───────────┘
```
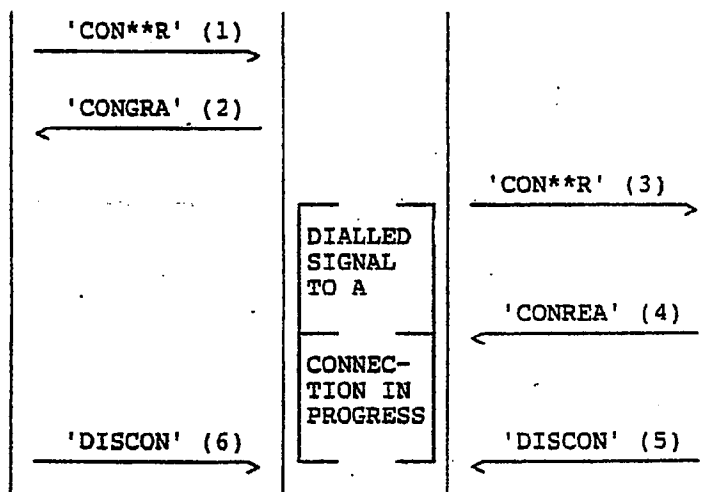
CON**R (1)

Sender:	A-PARTY
Addressee:	B-PARTY
Traf State	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

CONGRA (2)

Sender:	B-PARTY
Addressee:	A-PARTY
Traf State	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	W
Conn. I.D.	Y

CON**R (3)

Sender:	A-PARTY
Addressee:	B-PARTY
Traf State:	OK
DIGITAL_F:	X
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

CONREA (4)

Sender:	B-PARTY
Addressee:	A-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

Cantel Mobitex

Nr No	
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Datum Date	Rev	F. File
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DISCON (5)   DISCON (6)

```
Sender:      B-PARTY          Sender:      A-PARTY
Addressee:   A-PARTY          Addressee:   B-PARTY
Traf State:  OK               Traf State:  OK
DIGITAL_F:   0                DIGITAL_F:   0
EXTERN_F:    0                EXTERN_F:    0
Line no.:    Z                Line no.:    W
Conn. I.D.   Y                Conn. I.D.   Y
```

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Cantel Mobitex	Nr No 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fil File MTS09B.2

Dialogue 8.6.2

A party: Prot_2B
B party: Prot_1 or Prot_2A

The B party is active and generates HOOK-OFF.

A-party   MBX-network   B-party

'CON**R' (1) →

'CON**R' (2) →

DIALLED
SIGNAL
TO A

'CONREA' (3) ←

CONNEC-
TION IN
PROGRESS

'DISCON' (5) →   'DISCON' (4) ←

CON**R (1)

Sender:	A-PARTY
Addressee:	B-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	W
Conn. I.D.	Y

CON**R (2)

Sender:	A-PARTY
Addressee:	B-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

CONREA (3)

Sender:	B-PARTY
Addressee:	A-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

DISCON (4)

Sender:	B-PARTY
Addressee:	A-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

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Exhibit 2, p. 368

Cantel Mobitex ~	Nr. No 52/1056 - A 296 5171/2 Ue		
	Datum - Date 1990-02-23	Rev A	Fr. File MTS09B.2

```
DISCON (5)

Sender:      A-PARTY
Addressee:   B-PARTY
Traf State:  OK
DIGITAL_F:   0
EXTERN_F:    0
Line no.:    W
Conn. I.D.   Y
```
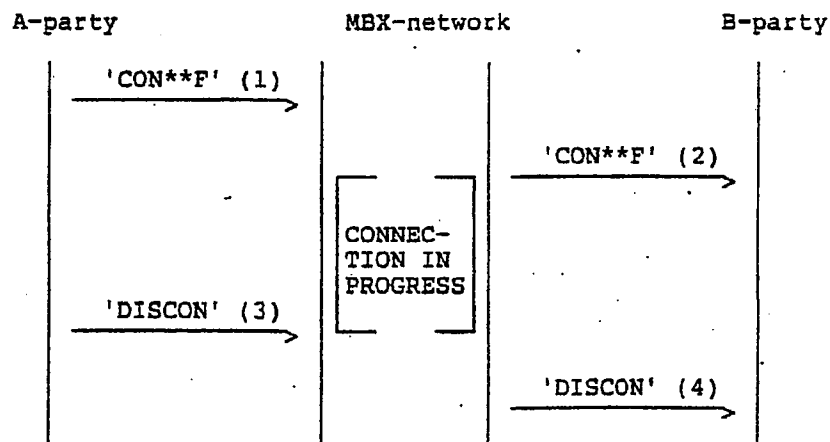
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Cantel Mobitex	Sr No 52/1056 - A 296 5171/2 Ue	
	Date Date 1990-02-23	Rev A	File File MTS09B.2

8.7   Conflicting connection requests.

Dialogue 8.7.1

A party: Prot_1
B party: Prot_1 or Prot_2A

B party has one free line

The B party is active and answers.


```
A-party                MBX-network              B-party

     |  'CON**R' (1)       |                    |
     |-------------------->|                    |
     |                     |         'CON**R' 'CON***'
     |                     |           (2)       (3)
     |                     |         ------->   <-----
     |                  .-------.    |                |
     |                  |DIALLED|    |                |
     |                  |SIGNAL |    |                |
     |                  |TO A   |    |                |
     |                  .-------.      'CONREA'  (4)
     |                     |         <---------------
     |                  .-------.    |                |
     |                  |CONNEC-|    |  'CON***' (5)  |
     |                  |TION IN|    |  ------------->
     |                  |PROGRESS|   |                |
     |                  .-------.    |                |

                        etc.
```
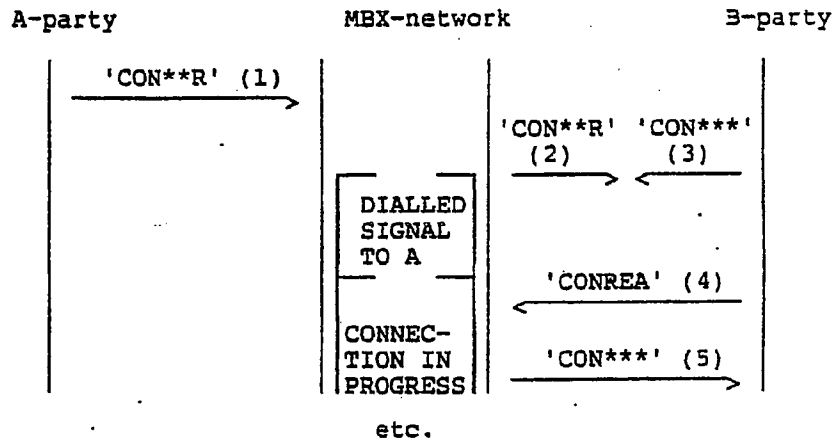
COMMENT : The network always has priority with calls to
          terminals Prot_1 and Prot_2A. In the case above,
          the network returns CON**R̄ (3). With the aid of
          conn I.D., sender and addressee, the terminal
          must be able to see that order 5 does not apply
          to the current connection.

Note that the sequence of orders 4 and 5 can be reversed.

CON**R (1)   CON**R (2)

Sender: A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Traf State: OK   Traf State: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   Z
Conn. I.D. Y   Conn. I.D. Y

Cantel Mobitex ~	Nr · No 52/1056 - A 296 5171/2 Ue		
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CON*** (3)

Sender: B-PARTY
Addressee: 'C-PARTY'
Traf State: OK
DIGITAL_F: 0
EXTERN_F: 0
Line no.:   0
Conn. I.D.   U

CONREA (4)

Sender: B-PARTY
Addressee: A-PARTY
Traf State: OK
DIGITAL_F: 0
EXTERN_F: 0
Line no.:   Z
Conn. I.D.   Y

CON*** (5)

Sender: B-PARTY
Addressee: 'C-PARTY'
Traf State: CONGEST
DIGITAL_F: 0
EXTERN_F: 0
Line no.:   0
Conn. I.D.   U

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A 296 5133-3

Cantel Mobitex ~	Nr Xo. 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fi. File MTS09B.2

Dialogue 8.7.2

A party: Prot_1
B party: Prot_2B

B party has one free line

The B party is active and answers.

```
A-party                MBX-network              B-party

      |  'CON**R' (1)  |                      |
      |----------------|----------->          |
      |                |                      |
      |                |        'CON**R'  'CON***'
      |                |          (2)        (3)
      |                |  +--------+---------->  <----
      |                |  |DIALLED |          |
      |                |  |SIGNAL  |          |
      |                |  |TO A    |  'DISCON' (4)
      |                |  +--------+  <----------
      |  'DISCON' (5)  |                      |
      |  <-------------|                      |
      |                |                      |
```
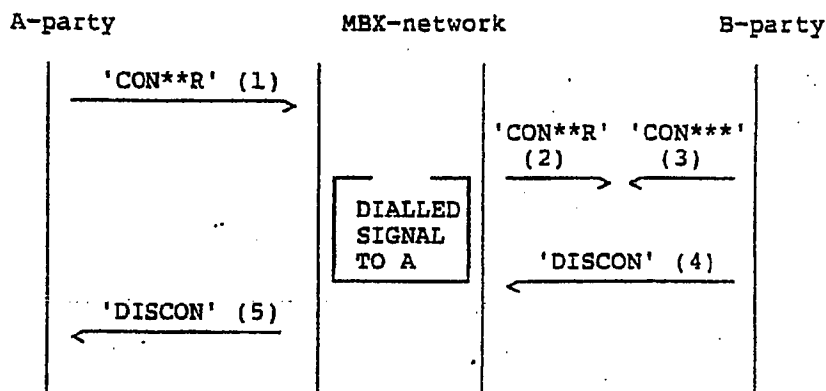
COMMENT : Terminal Prot_2B has priority with calls to the
         network. In the case above, the terminal sends
         DISCON(4) as response to CON**R(2). Signal
         CON*** reach C-party.

CON**R (1)   CON**R (2)

Sender: A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Traf State: OK   Traf State: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   dont care=H
Conn. I.D.   Y   Conn. I.D.   Y

CON*** (3)   DISCON (4)

Sender: B-PARTY   Sender: B-PARTY
Addressee: 'C-PARTY'   Addressee: A-PARTY
Traf State: OK   Traf State: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   N   Line no.:   H
Conn. I.D.   U   Conn. I.D.   Y

Cantel Mobitex

Nr Nr	52/1056 - A 296 5171/2 Ue		
Datum · Date		Rev	Fr. Fr.a
1990-02-23		A	MTS09B.2

```
DISCON (5)

Sender:      B-PARTY
Addressee:   A-PARTY
Traf State:  OK
DIGITAL F:   0
EXTERN F:    0
Line no.:    0
Conn. I.D.   Y
```

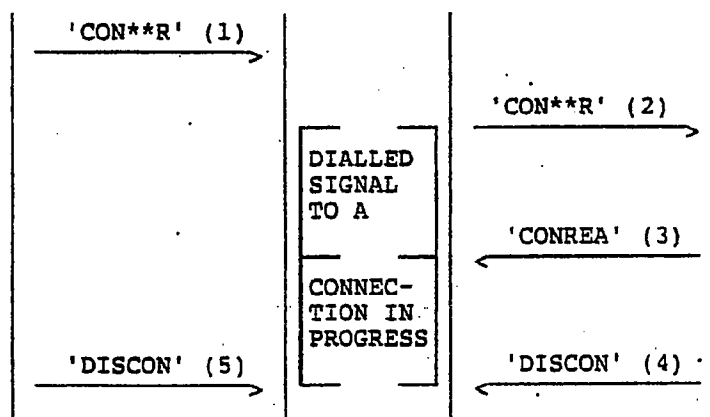| Cantel Mobitex	Nr. Nr 52/1056 - A 296 5171/2 Ue		
	Datum - Date 1990-02-23	Rev A	Fi. F.a MTS09B.2

Dialogue 8.7.3

A party: Prot_1
B party: Prot_2A

B party has more than one line free for real time connection.

The B party is active and answers.

A-party   MBX-network   B-party

```
    │   'CON**R' (1)       │                           │
    │─────────────────────▶│                           │
    │                      │        'CON**R'  'CON***'  │
    │                      │          (2)       (3)     │
    │                      │┌────────┐──────▶ ◀──────  │
    │                      ││DIALLED │                  │
    │                      ││SIGNAL  │                  │
   ┐│                      ││TO A    │   'CONREA' (4)   │
    │                      │└────────┘◀───────────────  │
    │                      │┌────────┐                  │
    │                      ││CONNEC- │   'CONGRA' (5)   │
    │                      ││TION IN │──────────────────▶│
    │                      ││PROGRESS│                  │
    │                      │└──etc.──┘                  │
```
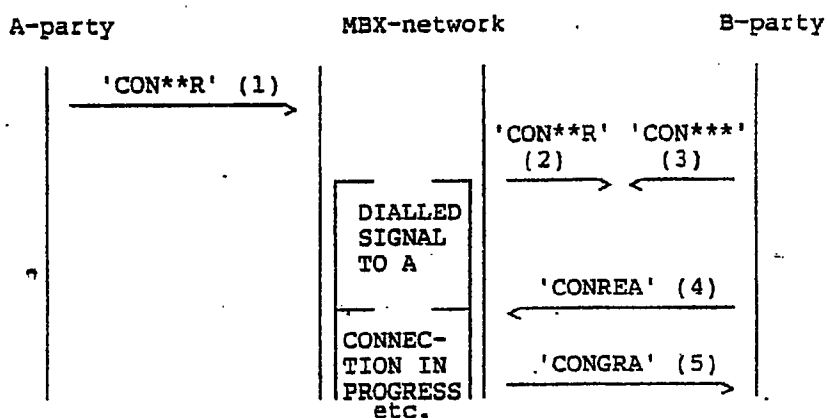
COMMENT : In the case above, the calls are treated
          independently of each other.

Note that the sequence of orders 4 and 5 can be reversed.

CON**R (1)   CON**R (2)

Sender: A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Traf State: OK   Traf State: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   z
Conn. I.D.   Y   Conn. I.D.   Y

CON*** (3)   CONREA (4)

Sender: B-PARTY   Sender: B-PARTY
Adddressee: 'C-PARTY'   Addressee: A-PARTY
Traf State: OK   Traf State: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   z
Conn. I.D.   U   Conn. I.D.   Y

Cantel Mobitex ™	Nr Nr 52/1056 – A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fil File MTS09B.2

CONGRA (5)

```
Sender:     'C-PARTY'
Addressee:  B-PART
Traf State: OK
DIGITAL_F:  0
EXTERN_F:   0
Line no.:   V
Conn. I.D.  U
```

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Cantel Mobitex	Nr. No. 52/1056 – A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fil. File MTS09B.2

Dialogue 8.7.4

A party: Prot_1
B party: Prot_2B

B party has more than one line free for real time connection.

The B party is active and answers.

A-party   MBX-network   B-party

     'CON**R' (1)
     ─────────────────►

                         ┌────────┐   'CON**R' 'CON***'
                         │DIALLED │   (2)   (3)
                         │SIGNAL │   ──────►   ◄──────
                         │TO A   │
                         └────────┘   'LINSEL' (4)
                                       ◄──────────────
                         ┌────────┐
                         │CONNEC- │   'CONREA' (5)
                         │TION IN │   ◄──────────────
                         │PROGRESS│
                         └────────┘
                            etc.
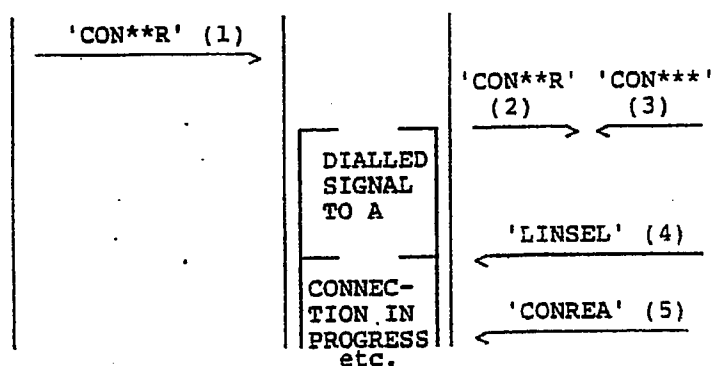
COMMENT : In the case above, the calls are treated
          independently of each other.

CON**R (1)

Sender:	A-PARTY
Addressee:	B-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

CON**R (2)

Sender:	A-PARTY
Addressee:	B-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	dont care
Conn. I.D.	Y

CON*** (3)

Sender:	B-PARTY
Adddressee:	'C-PARTY'
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	N
Conn. I.D.	U

LINSEL (4)

Sender:	B-PARTY
Addressee:	A-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

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A 292 5153-3

Cantel Mobitex ™

Nr. No.	52/1056 – A 296 5171/2 Ue
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Fl. File MTS09B.2	

CONREA (5)

```
Sender:      B-PARTY
Addressee:   A-PARTY
Traf State:  OK
DIGITAL_F:   0
EXTERN_F:    0
Line no.:    Z
Conn. I.D.   Y
```

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A 292 5153/3

Cantel Mobitex™	Nr No 52/1056 – A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fil File MTS09B.2

8.8   Conflicting disconnection orders.

Dialogue 8.8.1

A party: Prot_1
B party: Prot_1 or Prot_2A

The B-party is active and answers. The A-party and B-party both disconnect the real time connection but not at the same time.

```
A-party              MBX-network                B-party

     |'CON**R' (1)        |                        |
     |─────────────────>  |                        |
     |                    |        'CON**R' (2)     |
     |                    | ┌─────┐ ──────────────> |
     |                    | │DIALLED│                |
     |                    | │SIGNAL│                |
     |                    | │TO A  │                |
     |                    | │      │  'CONREA' (3)   |
     |                    | │      │ <────────────── |
     |                    | │CONNEC-│                |
     |                    | │TION IN│                |
     |'DISCON' (4)        | │PROGRESS│               |
     |─────────────────>  | └─────┘                 |
     |                    |        'DISCON' 'DISCON' |
     |                    |          (6)      (5)    |
     |                    |         ──>─<──          |
```
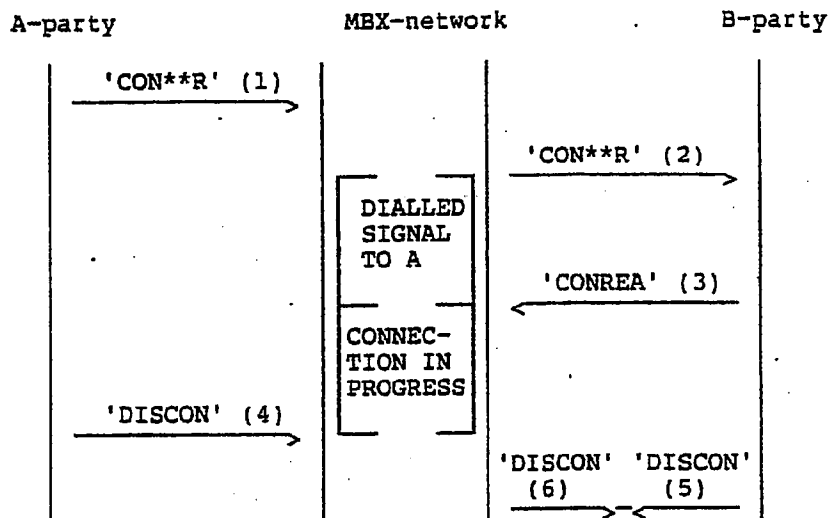
COMMENT : After the B-party has sent DISCON (5), the B-party considers the connection is no longer in operation. Since the connection no longer exists when the B party accepts DISCON (6), this packet can be ignored.

CON**R (1)		CON**R (2)	
Sender:	A-PARTY	Sender:	A-PARTY
Addressee:	B-PARTY	Addressee:	B-PARTY
Traf State:	OK	Traf State:	OK
DIGITAL_F:	0	DIGITAL_F:	0
EXTERN_F:	0	EXTERN_F:	0
Line no.:	0	Line no.:	z
Conn. I.D.	Y	Conn. I.D.	Y

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CONREA (3)

Sender: B-PARTY
Addressee: A-PARTY
Traf State: OK
DIGITAL_F: 0
EXTERN_F: 0
Line no.:   Z
Conn. I.D.   Y

DISCON (4)

Sender: A-PARTY
Addressee: B-PARTY
Traf State: OK
DIGITAL_F: 0
EXTERN_F: 0
Line no.:   0
Conn. I.D.   Y

DISCON (6)

Sender: A-PARTY
Addressee: B-PARTY
Traf State: OK
DIGITAL_F: 0
EXTERN_F: 0
Line no.:   Z
Conn. I.D.   Y

DISCON (5)

Sender: B-PARTY
Addressee: A-PARTY
Traf State: OK
DIGITAL_F: 0
EXTERN_F: 0
Line no.:   Z
Conn. I.D.   Y

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Cantel Mobitex	Nr No 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fs. F.4 MTS09B.2

8.9 B-party's reply does not reach the network

Dialogue 8.9.1

A party: Prot_1
B party: Prot_1 or Prot_2A

The B-party is active but does not make contact with the network when the request has been received.

```
A-party              MBX-network              B-party

   |  'CON**R' (1)       |    |                   |
   |-------------------->|    |                   |
   |                     |    |   'CON**R' (2)     |
   |                     | DIALLED |-------------->|
   |                     | SIGNAL  |               |
   |                     | TO A    |  'CONREA' (3) |
   |                     |    |<- - - - - - - - - -|
   |                     |    |                   |
```

COMMENT : The CONREA packet does not reach the network,
the B-party shall then consider that the CON**R
signal has not been received.

CON**R (1)

Sender:	A-PARTY
Addressee:	B-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

CON**R (2)

Sender:	A-PARTY
Addressee:	B-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

CONREA (3)

Sender:	B-PARTY
Addressee:	A-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

Cantel Mobitex

8.10 Connection request returned by the network

A returned request can be caused by :

    1) B-party is not active

    2) A-party lacks the service

    3) technical error in the network

    4) network is overloaded

etc.

<u>Dialogue 8.10.1</u>

A-party: Prot_1

```
A-party              MBX-network              B-party
   |   'CON***' (1)      |                       |
   |------------------>  |                       |
   |   'CON***' (2)      |                       |
   |<------------------  |                       |
   |                     |                       |
```
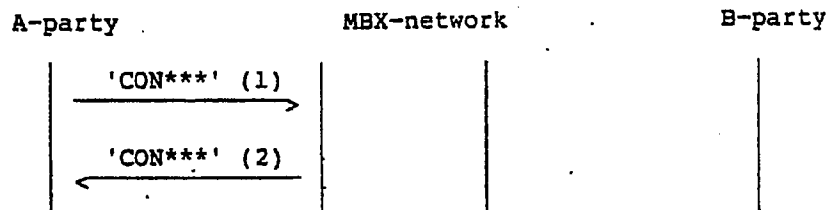
COMMENT : If a terminal accepts CON*** with a traffic
            state that is not OK, this should be considered
            as a DISCON.

CON*** (1)

```
Sender:      A-PARTY
Addressee:   B-PARTY
Traf State:  OK
DIGITAL F    0
EXTERN_F:    0
Line no.:    0
Conn. I.D.   Y
```

CON*** (2)

```
Sender:      A-PARTY
Addressee:   B-PARTY
Traf State:     NO_TRANSFER
             or ILLEGAL
             or CONGEST
             or ERROR
             or BUSY
DIGITAL_F:   0
EXTERN_F:    0
Line no.:    0
Conn. I.D.   Y
```

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Cantel Mobitex⁻	Nr No 52/1056 – A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Fa File MTS09B.2

Dialogue 8.10.2

A-party: Prot_2B

A-party   MBX-network   B-party

'CON***' (1)

'CON***' (2)

COMMENT : If a terminal accepts CON*** with a traffic
          state that is not OK, it should be considered as
          a DISCON.

CON*** (1)   CON*** (2)

Sender: A-PARTY   Sender: A-PARTY
Addressee: B-PARTY   Addressee: B-PARTY
Traf State: OK   Traf State: NO TRANSFER
DIGITAL F   0   or ILLEGAL
EXTERN_F: 0   or CONGEST
Line no.:   W   or ERROR
Conn. I.D. Y   or BUSY
                                  DIGITAL_F: 0
                                  EXTERN_F: 0
                                  Line no.:   W
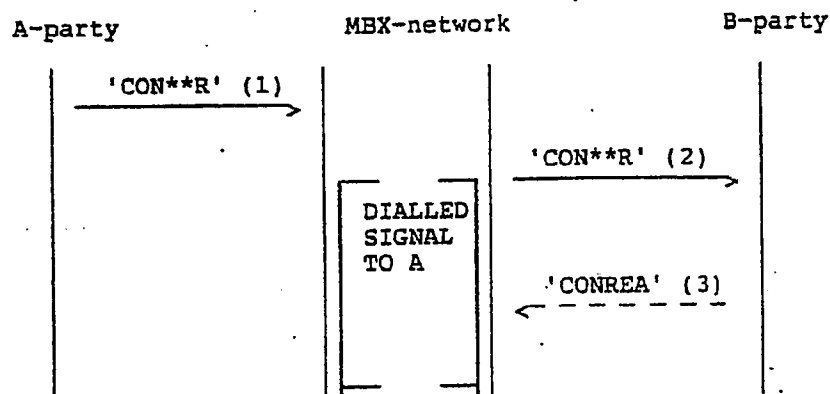   Conn. I.D.   Y

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Cantel Mobitex™	Nr. No 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	Pl. File MTS09B.2

Dialogue 8.10.3

A-party: Prot_2A

Two cases are possible:

Case 1:

A-party   MBX-network   B-party

```
      |-------- 'CON***' (1) -------->|              |              |
      |<------- 'CON***' (2) ---------|              |              |
```

COMMENT : If a terminal receives CON*** with a traffic
          state that is not OK, it should be considered as
          a DISCON.

Case 2:

A-party   MBX-network   B-party

```
      |-------- 'CON***' (1) -------->|              |              |
      |<------- 'CONGRA' (2) ---------|              |              |
      |<------- 'CON***' (3) ---------|              |              |
```

COMMENT : If a terminal receives CON*** with a traffic
          state that is not OK, it should be considered as
          a DISCON.

CON*** (1)   CONGRA (2)

Sender: A-PARTY   Sender: B-PARTY
Addressee: B-PARTY   Addressee: A-PARTY
Traf State: OK   Traf State: OK
DIGITAL_F   0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   line no.:   W
Conn. I.D.   Y   Conn. I.D.: Y

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```
CON*** (3)

Sender:      A-PARTY
Addressee:   B-PARTY
Traf State:    NO_TRANSFER
          or ILLEGAL
          or CONGEST
          or ERROR
          or BUSY
DIGITAL F    0
EXTERN_F:    0
Line no.:    W
Conn. I.D.   Y
```

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8.11 Non ordinary disconnect

This kind of disconnect is used when the network for some reason has lost the registration of connections.

Dialogue 8.11.1

A-party: Prot_1
B-party: Prot_1
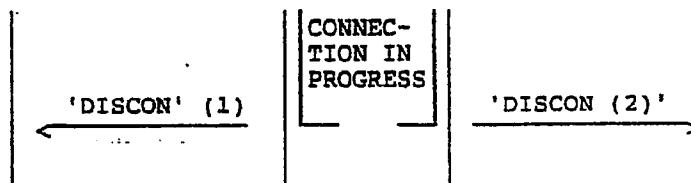
DISCON (1) and (2)

Sender: MBX
Addressee: All terminal group man or
            Fixed terminal man
Traf State: OK
DIGITAL F   0
EXTERN_F: 0
Line no.:   0
Conn. I.D. 0

COMMENT : Terminals shall always disconnect when receiving
          the DISCON.

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Dialogue 8.11.2

A-party: Prot_2A or Prot_2B
B-party: Prot_2A or Prot_2B

A-party   MBX-network   B-party

                    ┌─────────────┐
                    │ CONNEC-   │
                    │ TION IN   │
                    │ PROGRESS   │
   ◄── 'DISCON' (1) └─────────────┘ 'DISCON (2)' ──►

DISCON (1) and (2)

Sender: MBX
Addressee: Fixed terminal man
Traf State: OK
DIGITAL F   0
EXTERN_F: 0
Line no.:   Z
Conn. I.D.   0

COMMENT : Terminals shall always disconnect when receiving
          this DISCON. Line number Z is in range 1 to N.
          N is maximum number of lines to this fixed
          terminal.

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8.12 Request for non ordinary disconnect.

This kind of disconnect is used when the terminal has lost the registration of connections.

Valid for fixed terminal Prot_2A or Prot_2B.

Fixed term   MBX-network

'DISCON' (1) ———————————>

'DISCON' (2) <———————————

'DISCON' (3) <———————————

.
.

'DISCON' (N) <———————————

'DISCON' (N+1) <———————————

DISCON (1)   DISCON (2)

Sender: Fixed term   Sender: MBX
Addressee: MBX   Addressee: Fixed term
Traf State: OK   Traf state: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   0   Line no.:   1
Conn. I.D.   0   Conn. I.D.   0

DISCON (3)   DISCON (N)

Sender: MBX   Sender: MBX
Addressee: Fixed term   Addressee: Fixed term
Traf State: OK   Traf state: OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   2   Line no.:   N-1
Conn. I.D.   0   Conn. I.D.   0

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```
DISCON (N+1)

Sender:     MBX
Addressee:  Fixed term
Traf State: OK
DIGITAL_F:  0
EXTERN_F:   0
Line no.:   N
Conn. I.D.  0


COMMENT : Terminals shall always disconnect when receiving
          this DISCON.  N is maximum number of lines to
          this fixed terminal. Only fixed terminals with
          more than one line may send DISCON(1).
```
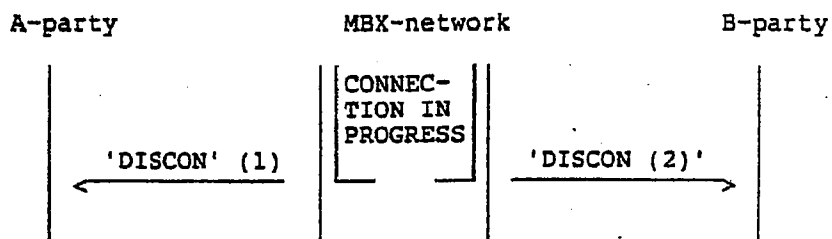
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8.13   Request for connection to unknown B-party

The addressee in CON*** is unknown in the terminal, e.g. personal subscription has just logged out.

Instead of a CONREA or a returned CON***, the terminal should send a DISCON with the subscriber flag UNKNOWN_F=1.

```
A-party                    MBX-network              B-terminal

       │   'CON***'  (1)      │                         │
       │─────────────────────>│                         │
       │                      │                         │
       │                      │       'CON***'  (2)      │
       │                      │ ────────────────────────>│
       │                   ┌────────┐                   │   B-party
       │                   │ DIALLED │                   │   unknown
       │                   │ SIGNAL  │    'DISCON'  (3)   │
       │                   │ TO A    │ <──────────────── │
       │                   └────────┘                   │
       │   'CON***'  (4)      │                         │
       │ <────────────────── │                         │
```
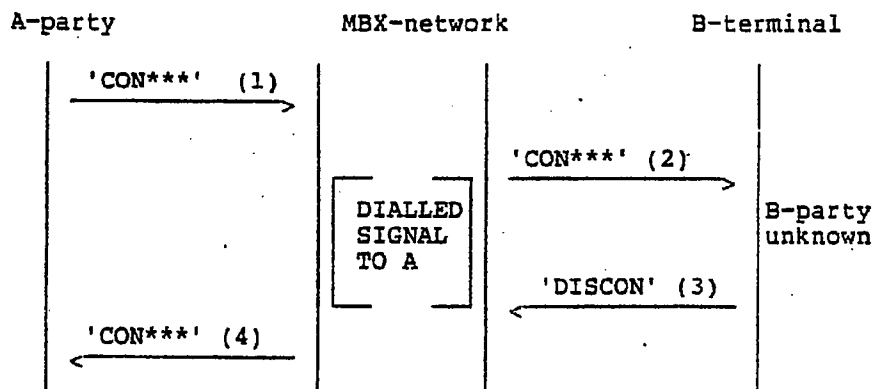
COMMENT : The connection identity which the A-party
           selects for CON*** (1) shall be included in all
           orders processed by the relevant connection.
           Orders 2-4 in this case.

CON*** (1)

Sender: : A-PARTY
Addressee: B-PARTY
Traf State: OK
DIGITAL_F: 0
EXTERN_F: 0
Line no.:   0
Conn. I.D.   Y

CON*** (2)

Sender: A-PARTY
Addressee: B-PARTY
Traf State: OK
DIGITAL_F: 0
EXTERN_F: 0
Line no.:   Z
Conn. I.D.   Y

DISCON (3)

Sender: B-PARTY
Addressee: A-PARTY
Traf State: OK
DIGITAL_F: 0
EXTERN_F: 0
UNKNOWN_F: 1
Line no.:   Z
Conn. I.D.   Y

CON*** (4)

Sender: A-PARTY
Addressee: B-PARTY
Traf State: NO_TRANSFER
DIGITAL_F: 0
EXTERN_F: 0
UNKNOWN_F: 0
Line no.:   0
Conn. I.D.   Y

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8.14 Enable / disable lines for fixed terminals

This kind of enable and disable is used when a fixed terminal, for some reason, does not want the network to connect on a special line.

Fixed terminal Prot_2A.

Case 1:

Fixed terminal   MBX-network   status of line Z

```
                                                    |
                                              ENABLED
        'LINEOFF'(1)                               |
        ───────────────>                           ┼
                                                    |
                                              DISABLED
        'LINEON' (2)                               |
        ───────────────>                           ┼
                                                    |
                                              ENABLED
                                                    |
```

LINEOFF (1)   LINEON (2)
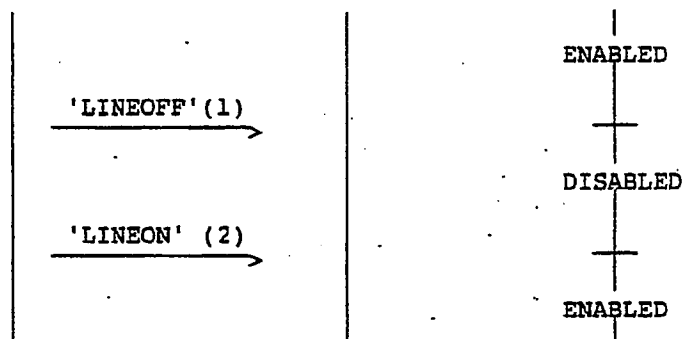
Sender:	Fixed terminal		Sender:	Fixed terminal
Addressee:	MBX		Addressee:	MBX
Traf State:	OK		Traf State	OK
DIGITAL_F:	0		DIGITAL_F:	0
EXTERN_F:	0		EXTERN_F:	0
Line no.:	Z		Line no.:	Z

NOTE : The network may send packets CSUBCOM.CLOOPON and CSUBCOM.CLOOPOFF during the time in disabled mode. See Appendix B-11.

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Case 2:

Fixed terminal   MBX-network   status of line Z

```
      |                        |                    |
      |                        |               ENABLED
      |   'LINEOFF'(1)         |                    |
      |----------------------->|                    +
      |                        |                    |
      |                        |               DISABLED
      |   'DISCON' (2)         |                    |
      |<-----------------------|                    +
      |                        |                    |
      |                        |               ENABLED
      |                        |                    |
      |                        |                    |
```

LINEOFF (1)   DISCON (2)

Sender: Fixed terminal   Sender: MBX
Addressee: MBX   Addressee: Fixed terminal
Traf State: OK   Traf state   OK
DIGITAL_F: 0   DIGITAL_F: 0
EXTERN_F: 0   EXTERN_F: 0
Line no.:   Z   Line no.:   Z
                                   Conn. I.D.   0

COMMENT : DISCON(2) is of type "Non ordinary disconnect".
          If the fixed terminal wants the network to
          disable the line after receiving DISCON(2), it
          has to send LINEOFF(1) again.

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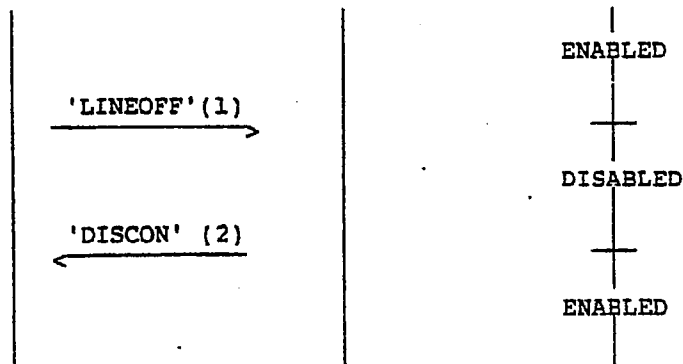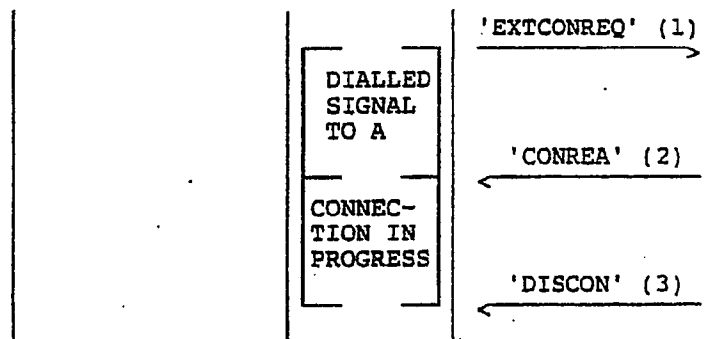| Cantel Mobitex	Nr. No 52/1056 - A 296 5171/2 Ue	
	Datum · Date 1990-02-23	Rev A	Fü · Fu MTS09B.2

9 EXTERNAL CONNECTION

9.1 From circuit switched network

B party is active and replies.

A party in another network	MBX-network	B-party

COMMENTS : The procedure is completely identical to a
ordinary connection. The only difference is
that EXTCONREQ is used instead of CON**R.

EXTCONREQ (1)   CONREA (2)

Sender: EXT NET   Sender: B-PARTY
Addressee: B-PARTY   Addressee: EXT NET
Traf State: OK   Traf State: OK
DIGITAL F: 0   DIGITAL F: 0
EXTERN F: 1   EXTERN F: 0
Line no.:   Z   Line no.:   Z
Conn. I.D.   Y   Conn. I.D.   Y

Ext.sub.no: A-party's number in
            external network, if known

DISCON (3)

Sender: B-PARTY
Addressee: EXT NET
Traf State: OK
DIGITAL F: 0
EXTERN F: 0
Line no.:   Z
Conn. I.D.   Y

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9.2 To circuit switched network

A-party   MBX-network   B-part in another network

'EXTCONREQ'(1)

DIALLED SIGNAL TO A

CONNEC-TION IN PROGRESS
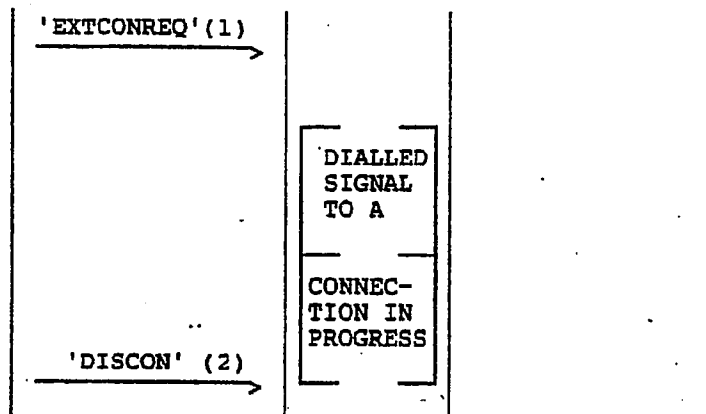
'DISCON' (2)

COMMENT : The procedure is completely identical to a ordinary connection. The only difference is that EXTCONREQ is used instead of CON**R.

EXTCONREQ (1)   DISCON (2)

SENDER:	A-PARTY		Sender:	A-PARTY
Addressee:	EXT NET		Addressee:	EXT NET
Traf State:	OK		Traf State:	OK
DIGITAL_F:	0		DIGITAL_F:	0
EXTERN_F:	1		EXTERN_F:	0
Line no.:	0		Line no.:	0
Conn. I.D.	Y		Conn. I.D.	Y

Ext.sub.no: B-party's number in external network

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10 CONNECTION TO GROUP

10.1 Ordinary circuit switched connection to group
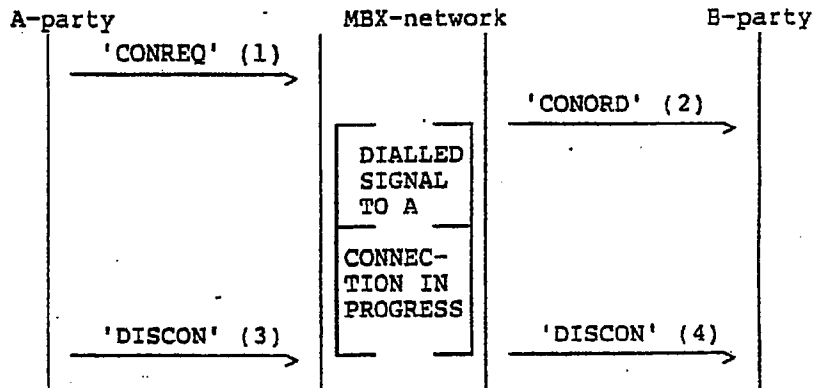
COMMENT : If the B-party accepts CONORD, CONREA shall **not** be sent. Neither may the B-party send DISCON on a connection that has been generated with CONORD.

If there is no HOOK-OFF within 60 seconds after the reception of CONORD or if the B-party generates HOOK-ON during the connection, the B-part terminal shall return to the system channel without sending DISCON. More details of this are given in the link layer for mobile terminals.

We do strongly recommend that, after reception of a CONORD, the terminal turns the loudspeaker on.

CONREQ (1)

Sender:	A-PARTY
Addressee:	B-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	0
Conn. I.D.	Y

CONORD (2)

Sender:	A-PARTY
Addressee:	B-PARTY
Traf State:	OK
DIGITAL_F:	0
EXTERN_F:	0
Line no.:	Z
Conn. I.D.	Y

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```
DISCON (3)                   DISCON (4)

Sender:      A-PARTY         Sender:      A-PARTY
Addressee:   B-PARTY         Addressee:   B-PARTY
Traf State: OK               Traf State: OK
DIGITAL_F:   0               DIGITAL_F:   0
EXTERN_F:    0               EXTERN_F:    0
Line no.:    0               Line no.:    Z
Conn. I.D.   Y               Conn. I.D.   Y
```

NOTE 1 :   If a fixed terminal is B-party in a group a
            normal CONREQ is used to the fixed terminal.

NOTE 2 :   CONORD(2) is repeated continuously and may
            therefore appear also during the connection.
            CONORD(2) is repeated to give terminals the
            possibillity to connect to the group connection
            after the group connection was made. This can
            be used if the terminal was busy when the group
            connection was made.

NOTE 3:   CONREQ(1) can also be MPAK CONFAST.

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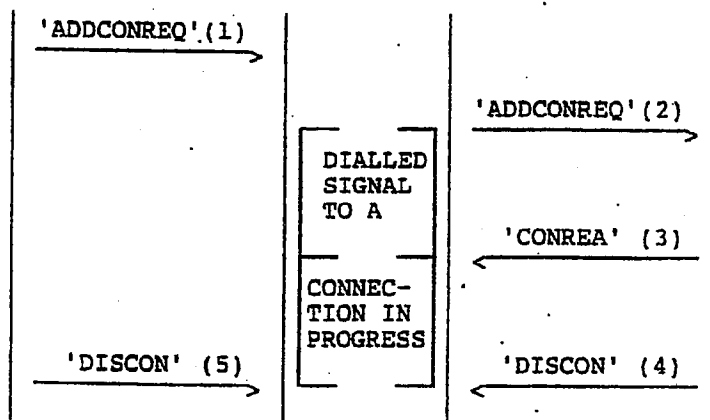| Cantel Mobitex	Nr No 52/1056 - A 296 5171/2 Ue
	Datum Date 1990-02-23 Rev A File MTS09B.2

11 ADDITIONAL CONNECTION

11.1 Ordinary additional connection

The A-party has one line for real time connection. The B party has one or more lines for real time connection.

The B party is active and replies.

```
A-party              MBX-network              B-party

    'ADDCONREQ'(1)
   ──────────────────►
                                  'ADDCONREQ'(2)
                       ┌────────┐ ──────────────────►
                       │ DIALLED│
                       │ SIGNAL │
                       │ TO A   │ 'CONREA' (3)
                       ├────────┤ ◄──────────────────
                       │CONNEC- │
                       │TION IN │
    'DISCON' (5)       │PROGRESS│ 'DISCON' (4)
   ──────────────────► └────────┘ ◄──────────────────
```

COMMENT : The procedure is identical to a ordinary
         connection. The only difference is that
         additional information 'S' follows the
         connection.

ADDCONREQ (1)   ADDCONREQ (2)

Sender:	A-PARTY	Sender:	A-PARTY
Addressee:	B-PARTY	Addressee:	B-PARTY
Traf State:	OK	Traf State:	OK
DIGITAL_F:	0	DIGITAL_F:	0
EXTERN_F:	0	EXTERN_F:	0
Line no.:	0	Line no.:	Z
Conn. I.D.	Y	Conn. I.D.	Y
Add. info:	OPTIONAL=S	Add. info:	S

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CONREA (3)

```
Sender:      B-PARTY
Addressee:   A-PARTY
Traf State:  OK
DIGITAL_F:   0
EXTERN_F:    0
Line no.:    Z
Conn. I.D.   Y
```

DISCON (4)

```
Sender.      B-PARTY
Addressee:   A-PARTY
Traf State:  OK
DIGITAL_F:   0
EXTERN_F:    0
Line no.:    Z
Conn. I.D.   Y
```

DISCON (5)

```
Sender:      A-PARTY
Addressee:   B-PARTY
Traf State:  OK
DIGITAL_F:   0
EXTERN_F:    0
Line no.:    0
Conn. I.D.   Y
```

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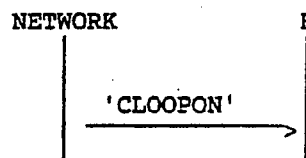|	
Nr. No. 52/1056 - A 296 5171/2 Ue	
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12 LINE TEST

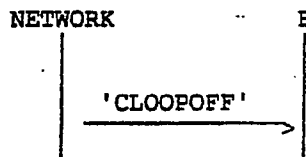The network generates 'CLOOPON' and 'CLOOPOFF' according to the criteria and with the structure given in Appendix A.

Dialogue 12.1:

Start of loop test.

```
NETWORK                    B
   |                       |
   |     'CLOOPON'         |
   |--------------------->|
   |                       |
```

Dialogue 12.2:

End of loop test.

```
NETWORK              ..    B
   |                       |
   |     'CLOOPOFF'        |
   |--------------------->|
   |                       |
```

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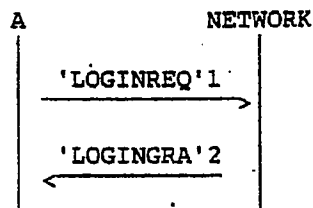| Cantel Mobitex™	Nr. No 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	F. File MTS09B.2

13 LOGIN

The factor common to all dialogues for log-in is that the original packet ('LOGINREQ') is generated by the A-party according to the criteria and with the structure stated in Appendix A. Reservation is stated for the respective dialogue.
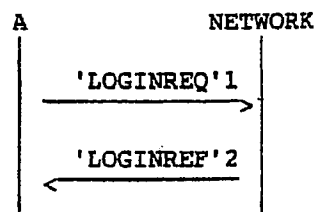
Dialogue 13.1:

Login granted.

```
        A                 NETWORK
        |                   |
        |   'LOGINREQ'1      |
        |------------------>|
        |                   |
        |   'LOGINGRA'2      |
        |<------------------|
        |                   |
```

The network generates 'LOGINGRA' according to the criteria and with the structure stated in Appendix A.

Dialogue 13.2:

Login refused by the network.

```
        A                 NETWORK
        |                   |
        |   'LOGINREQ'1      |
        |------------------>|
        |                   |
        |   'LOGINREF'2      |
        |<------------------|
        |                   |
```

The network generates 'LOGINREF' according to the criteria and with the structure stated in Appendix A.

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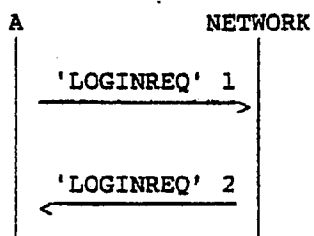| Cantel Mobitex	Nr No. 52/1056 - A 296 5171/2 Ue		
	Datum Date 1990-02-23	Rev A	File MTS09B.2

Dialogue 13.3:

Login has not taken place.

```
        A              NETWORK
        |                 |
        |  'LOGINREQ' 1   |
        |---------------->|
        |                 |
        |  'LOGINREQ' 2   |
        |<----------------|
        |                 |
```

a) Log-in may not take place. Incorrect subscription
   number may have been given.

   'LOGINREQ' 2 is returned with traffic state = ILLEGAL

b) The network is overloaded.

   'LOGINREQ' 2 is returned with traffic state = CONGEST

c) A technical fault may have occured.

   'LOGINREQ' 2 is returned with traffic state = ERROR

Sektion:

Ersätt:

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